Hearing Date: November 17, 2021 at 10:00 a.m. (Eastern Time)

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UNITED STATES BANKRUPTCY COURT
SOUTHERN DISTRICT OF NEW YORK

In re:	**Chapter 11**
FRONTIER COMMUNICATIONS CORPORATION, *et al.*,[1]	**Case No. 20-22476 (RDD)**
Debtors.	**(Jointly Administered)**

RESPONSE OF INTELLECTUAL VENTURES II LLC TO THE REORGANIZED DEBTORS' OMNIBUS OBJECTION TO CLAIMS ASSERTED BY INTELLECTUAL VENTURES II LLC

Intellectual Ventures II LLC ("IV') respectfully submits this Response to the *Reorganized Debtors' Omnibus Objection to Claims Asserted by Intellectual Ventures II LLC* (ECF 2017) (the "Objection").

[1] The last four digits of Debtor Frontier Communications Corporation's tax identification number are 9596. Due to the large number of debtor entities in these chapter 11 cases, for which joint administration has been granted, a complete list of the debtor entities and the last four digits of their federal tax identification numbers are not provided herein. A complete list of such information may be obtained on the website of the Debtors' proposed claims and noticing agent at https://cases.primeclerk.com/ftr. The location of the Debtors' service address for purposes of these chapter 11 cases is: 50 Main Street, Suite 1000, White Plains, New York 10606.

1. On August 18, 2020, IV filed proofs of claim alleging pre-petition patent infringement. *See, e.g.*, Claim No. 2526, attached hereto as Exhibit A. More particularly, IV alleges that the Debtors directly infringed five U.S. patents owned by IV. IV seeks allowance of its claims in the amount of $9,396,000 on account of the Debtors' pre-petition infringement.

2. The Debtors continued to infringe IV's patents post-petition. Accordingly, on June 1, 2021, IV filed a *Request for Payment of Administrative Expense for Post-Petition Infringement of Patents Held by Intellectual Ventures II LLC* (ECF 1880), attached hereto as Exhibit B. IV alleged that the Debtors' post-petition infringement of two of the unexpired patents constituted an administrative expense for which IV was entitled to payment. IV seeks payment of at least $1,699,102 on account of post-petition infringement.[2]

3. Damages under the Patent Act are governed by 35 U.S.C. § 284, which states that "[u]pon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." When the infringement is willful, as is the case here, "the court may increase the damages up to three times the amount found or assessed." IV seeks a reasonable royalty, willfulness damages in light of Frontier's continued use of the patented technology following the date it gained knowledge of infringement (date to be determined but no later than the filing of the proofs of claim), interest and costs.

4. The asserted IV patents relate to digital subscriber line (DSL) technology, which the Debtors (and now the Reorganized Debtors) provide to millions of their customers to provide high-speed internet service. IV alleges that the Debtors infringed, and the Reorganized Debtors

[2] The Reorganized Debtors continue to infringe IV's patents and accrue damages following the effective date of the plan. IV reserves all rights with respect to such infringement.

continue to infringe, IV's patents by operating equipment known as digital subscriber line access multiplexers (DSLAM's) to provide DSL services in accordance with certain industry technical standards, including what are known as the ADSL2/2+ and VDSL2 standards. IV's allegations concerning the Debtors' pre- and post-petition infringement are set forth in further detail in IV's proofs of claim and supporting documentation, as well as IV's request for payment, which are incorporated herein by reference. (*See* Exhibits A, B.)

5. On October 17, 2021, the Reorganized Debtors filed their Objection to IV's claims. (ECF 2017.) The Reorganized Debtors contend that the Debtors did not infringe IV's patents, that the patents are not standards essential, that the patents are invalid, and that IV has not stated a claim upon which relief may be granted. The Reorganized Debtors also contend that IV has overstated its measure of damages.

6. The Reorganized Debtors' objections are without merit and should be rejected in their entirety. As set forth in detail in IV's proofs of claim, the Debtors infringed IV's valid standards-essential patents both pre- and post-petition. In addition, IV's damages are readily established. IV's damages claim is based on a patent license agreement with at least one similarly situated competitor of the Debtors, who is roughly the same size and offers the same infringing services. IV also disputes that the comparable licenses are not FRAND and/or do not inform a FRAND royalty calculation for the Debtors. Moreover, the Debtors and Reorganized Debtors have not negotiated in good faith over a FRAND license, thereby forfeiting any rights they may have to such a license. In short, IV's damages claims are fair and reasonable, even under a FRAND analysis.

7. IV and the Reorganized Debtors have met-and-conferred about a schedule and scope for an adjudication of IV's claims in the context of these chapter 11 proceedings, subject to

the approval of this Court. IV understands that the parties have agreed, subject to the Court's approval, that the Court should first address the issue of damages. The Reorganized Debtors state that they intend to reserve their rights to potentially dispute liability at a later time. The parties generally agree to the schedule set forth in the Objection at page 13, however, the parties are still negotiating the scope of deliverables for some of the deadlines (*e.g.*, November 22, 2021, infringement contentions). The parties have also been negotiating the discovery limits, and IV understands the parties to have essentially agreed to the limits in the Objection, with the exceptions that fact witness depositions be limited to three and interrogatories be limited to eight. The parties hope to finalize their discussions with the goal of presenting an agreed schedule to the Court at or around the time of the initial hearing to be held on November 17.

Dated: November 12, 2021

Respectfully submitted,

/s/ David A. Herman

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Jeffrey B. Plies (admitted *pro hac vice*)
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Counsel to Intellectual Ventures II LLC

CERTIFICATE OF SERVICE

I hereby certify that on November 12, 2021, I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system, which will send a notification of such filing to all ECF recipients in the above-captioned matter.

Dated: November 12, 2021

Respectfully submitted,

/s/ David A. Herman

Martin J. Black (admitted *pro hac vice*)
Jeffrey B. Plies (admitted *pro hac vice*)
David A. Herman
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Counsel to Intellectual Ventures II LLC

17866207

EXHIBIT A

United States Bankruptcy Court, Southern District of New York

Fill in this information to identify the case (Select only one Debtor per claim form):

Debtor: Frontier Communications Corporation (20-22476)

Official Form 410

Proof of Claim

04/19

Read the instructions before filling out this form. This form is for making a claim for payment in a bankruptcy case. Do not use this form to make a request for payment of an administrative expense (other than a claim entitled to priority under 11 U.S.C. § 503(b)(9)). Make such a request according to 11 U.S.C. § 503.

Filers must leave out or redact information that is entitled to privacy on this form or on any attached documents. Attach redacted copies of any documents that support the claim, such as promissory notes, purchase orders, invoices, itemized statements of running accounts, contracts, judgments, mortgages, and security agreements. **Do not send original documents;** they may be destroyed after scanning. If the documents are not available, explain in an attachment.

A person who files a fraudulent claim could be fined up to $500,000, imprisoned for up to 5 years, or both. 18 U.S.C. §§ 152, 157, and 3571.

Fill in all the information about the claim as of the date the case was filed. That date is on the notice of bankruptcy (Form 309) **that you received.**

Part 1: Identify the Claim

1. **Who is the current creditor?**
   Intellectual Ventures II LLC
   Name of the current creditor (the person or entity to be paid for this claim)
   Other names the creditor used with the debtor

2. **Has this claim been acquired from someone else?**
   ☒ No
   ☐ Yes. From whom?

3. **Where should notices and payments to the creditor be sent?**
   Federal Rule of Bankruptcy Procedure (FRBP) 2002(g)

Where should notices to the creditor be sent?	**Where should payments to the creditor be sent?** (if different)
c/o Dechert LLP Attn.: Brett Stone Three Bryant Park 1095 Avenue of the Americas New York, NY 10036-6797	Amelia Buharin c/o Intellectual Ventures Attn: Accounts Payable Manager 3150 139th Ave SE Bellevue, WA 98005
Contact phone 212-698-3500 Contact email brett.stone@dechert.com	Contact phone 425-467-2300 Contact email abuharin@intven.com

4. **Does this claim amend one already filed?**
   ☒ No
   ☐ Yes. Claim number on court claims registry (if known)____ Filed on ____ MM / DD / YYYY

5. **Do you know if anyone else has filed a proof of claim for this claim?**
   ☒ No
   ☐ Yes. Who made the earlier filing?

Part 2: Give Information About the Claim as of the Date the Case Was Filed

6. **Do you have any number you use to identify the debtor?**
- [x] No
- [ ] Yes. Last 4 digits of the debtor's account or any number you use to identify the debtor: ____ ____ ____ ____

7. **How much is the claim?** $ 9,396,000.00 . **Does this amount include interest or other charges?**
- [x] No
- [ ] Yes. Attach statement itemizing interest, fees, expenses, or other charges required by Bankruptcy Rule 3001(c)(2)(A).

8. **What is the basis of the claim?**

Examples: Goods sold, money loaned, lease, services performed, personal injury or wrongful death, or credit card.

Attach redacted copies of any documents supporting the claim required by Bankruptcy Rule 3001(c).

Limit disclosing information that is entitled to privacy, such as health care information.

Patent infringement - see Addendum

9. **Is all or part of the claim secured?**
- [x] No
- [ ] Yes. The claim is secured by a lien on property.

Nature of property:
- ❑ Real estate. If the claim is secured by the debtor's principal residence, file a *Mortgage Proof of Claim Attachment* (Official Form 410-A) with this *Proof of Claim.*
- ❑ Motor vehicle
- ❑ Other. Describe: _____

Basis for perfection: _____

Attach redacted copies of documents, if any, that show evidence of perfection of a security interest (for example, a mortgage, lien, certificate of title, financing statement, or other document that shows the lien has been filed or recorded.)

Value of property: $_____

Amount of the claim that is secured: $_____

Amount of the claim that is unsecured: $_____ (The sum of the secured and unsecured amounts should match the amount in line 7.)

Amount necessary to cure any default as of the date of the petition: $_____

Annual Interest Rate (when case was filed) _____ %
- ❑ Fixed
- ❑ Variable

10. **Is this claim based on a lease?**
- [x] No
- [ ] Yes. **Amount necessary to cure any default as of the date of the petition.** $_____

11. **Is this claim subject to a right of setoff?**
- [x] No
- [ ] Yes. Identify the property: _____

12. **Is all or part of the claim entitled to priority under 11 U.S.C. § 507(a)?**

A claim may be partly priority and partly nonpriority. For example, in some categories, the law limits the amount entitled to priority.

☒ No

☐ Yes. *Check one:*

	Amount entitled to priority
☐ Domestic support obligations (including alimony and child support) under 11 U.S.C. § 507(a)(1)(A) or (a)(1)(B).	$
☐ Up to $3,025* of deposits toward purchase, lease, or rental of property or services for personal, family, or household use. 11 U.S.C. § 507(a)(7).	$
☐ Wages, salaries, or commissions (up to $13,650*) earned within 180 days before the bankruptcy petition is filed or the debtor's business ends, whichever is earlier. 11 U.S.C. § 507(a)(4).	$
☐ Taxes or penalties owed to governmental units. 11 U.S.C. § 507(a)(8).	$
☐ Contributions to an employee benefit plan. 11 U.S.C. § 507(a)(5).	$
☐ Other. Specify subsection of 11 U.S.C. § 507(a)( ) that applies.	$

* Amounts are subject to adjustment on 4/01/22 and every 3 years after that for cases begun on or after the date of adjustment.

13. **Is all or part of the claim entitled to administrative priority pursuant to 11 U.S.C. § 503(b)(9)?**

☒ No

☐ Yes. **Indicate the amount of your claim arising from the value of any goods received by the Debtor within 20 days before the date of commencement of the above case, in which the goods have been sold to the Debtor in the ordinary course of such Debtor's business. Attach documentation supporting such claim.** $

Part 3: Sign Below

The person completing this proof of claim must sign and date it. FRBP 9011(b).

If you file this claim electronically, FRBP 5005(a)(2) authorizes courts to establish local rules specifying what a signature is.

A person who files a fraudulent claim could be fined up to $500,000, imprisoned for up to 5 years, or both. 18 U.S.C. §§ 152, 157, and 3571.

Check the appropriate box:

☐ I am the creditor.
☒ I am the creditor's attorney or authorized agent.
☐ I am the trustee, or the debtor, or their authorized agent. Bankruptcy Rule 3004.
☐ I am a guarantor, surety, endorser, or other codebtor. Bankruptcy Rule 3005.

I understand that an authorized signature on this *Proof of Claim* serves as an acknowledgment that when calculating the amount of the claim, the creditor gave the debtor credit for any payments received toward the debt.

I have examined the information in this *Proof of Claim* and have a reasonable belief that the information is true and correct.

I declare under penalty of perjury that the foregoing is true and correct.

Signature: /s/ G. Eric Brunstad, Jr.
/s/ G. Eric Brunstad, Jr. (Aug 18, 2020 11:34 EDT)

Email: eric.brunstad@dechert.com

Name of the person who is completing and signing this claim:

Name: G. Eric Brunstad, Jr.
First name Middle name Last name

Title: Partner

Company: Dechert LLP
Identify the corporate servicer as the company if the authorized agent is a servicer.

Address: 1095 Avenue of the Americas
Number Street

New York NY 10036
City State ZIP Code

Contact phone: 212-698-3500 Email: eric.brunstad@dechert.com

Attach Supporting Documentation **(limited to a single PDF attachment that is less than 5 megabytes in size and under 100 pages):**

☒ **I have supporting documentation. (attach below)** ☐ **I do not have supporting documentation.**

Attachment

PLEASE REVIEW YOUR PROOF OF CLAIM AND SUPPORTING DOCUMENTS AND REDACT ACCORDINGLY PRIOR TO UPLOADING THEM. PROOFS OF CLAIM AND ATTACHMENTS ARE PUBLIC DOCUMENTS THAT WILL BE AVAILABLE FOR ANYONE TO VIEW ONLINE.

IMPORTANT NOTE REGARDING REDACTING YOUR PROOF OF CLAIM AND SUPPORTING DOCUMENTATION When you submit a proof of claim and any supporting documentation you must show only the last four digits of any social-security, individual's tax-identification, or financial-account number, only the initials of a minor's name, and only the year of any person's date of birth. If the claim is based on the delivery of health care goods or services, limit the disclosure of the goods or services so as to avoid embarrassment or the disclosure of confidential health care information.

A document has been redacted when the person filing it has masked, edited out, or otherwise deleted, certain information. The responsibility for redacting personal data identifiers (as defined in Federal Rule of Bankruptcy Procedure 9037) rests solely with the party submitting the documentation and their counsel. Prime Clerk and the Clerk of the Court will not review any document for redaction or compliance with this Rule and you hereby release and agree to hold harmless Prime Clerk and the Clerk of the Court from the disclosure of any personal data identifiers included in your submission. In the event Prime Clerk or the Clerk of the Court discover that personal identifier data or information concerning a minor individual has been included in a pleading, Prime Clerk and the Clerk of the Court are authorized, in their sole discretion, to redact all such information from the text of the filing and make an entry indicating the correction.

Official Form 410

Instructions for Proof of Claim

United States Bankruptcy Court 12/15

These instructions and definitions generally explain the law. In certain circumstances, such as bankruptcy cases that debtors do not file voluntarily, exceptions to these general rules may apply. You should consider obtaining the advice of an attorney, especially if you are unfamiliar with the bankruptcy process and privacy regulations.

A person who files a fraudulent claim could be fined up to $500,000, imprisoned for up to 5 years, or both.
18 U.S.C. §§ 152, 157 and 3571.

How to fill out this form

- **Fill in all of the information about the claim as of the date the case was filed.**
- **Fill in the caption at the top of the form.**
- **If the claim has been acquired from someone else, then state the identity of the last party** who owned the claim or was the holder of the claim and who transferred it to you before the initial claim was filed.
- **Attach any supporting documents to this form.** Attach redacted copies of any documents that show that the debt exists, a lien secures the debt, or both. (See the definition of *redaction* on the next page.)

  Also attach redacted copies of any documents that show perfection of any security interest or any assignments or transfers of the debt. In addition to the documents, a summary may be added. Federal Rule of Bankruptcy Procedure (called "Bankruptcy Rule") 3001(c) and (d).
- **Do not attach original documents because attachments may be destroyed after scanning.**
- **If the claim is based on delivering health care goods or services, do not disclose confidential health care information. Leave out or redact confidential information both in the claim and in the attached documents.**
- **A *Proof of Claim* form and any attached documents must show only the last 4 digits of any social security number, individual's tax identification number, or financial account number, and only the year of any person's date of birth.** See Bankruptcy Rule 9037.
- **For a minor child, fill in only the child's initials and the full name and address of the child's parent or guardian.** For example, write *A.B., a minor child* (*John Doe, parent, 123 Main St., City, State*). See Bankruptcy Rule 9037.

Confirmation that the claim has been filed

To receive confirmation that the claim has been filed, enclose a stamped self-addressed envelope and a copy of this form. You may view a list of filed claims in this case by visiting the Claims and Noticing Agent's website at https://cases.primeclerk.com/ftr.

Understand the terms used in this form

Administrative expense: Generally, an expense that arises after a bankruptcy case is filed in connection with operating, liquidating, or distributing the bankruptcy estate. 11 U.S.C. § 503.

Claim: A creditor's right to receive payment for a debt that the debtor owed on the date the debtor filed for bankruptcy. 11 U.S.C. §101 (5). A claim may be secured or unsecured.

Claim Pursuant to 11 U.S.C. §503(b)(9): A claim arising from the value of any goods received by the Debtor within 20 days before the date of commencement of the above case, in which the goods have been sold to the Debtor in the ordinary course of the Debtor's business. Attach documentation supporting such claim.

Creditor: A person, corporation, or other entity to whom a debtor owes a debt that was incurred on or before the date the debtor filed for bankruptcy. 11 U.S.C. §101 (10).

Debtor: A person, corporation, or other entity who is in bankruptcy. Use the debtor's name and case number as shown in the bankruptcy notice you received. 11 U.S.C. § 101 (13).

Evidence of perfection: Evidence of perfection of a security interest may include documents showing that a security interest has been filed or recorded, such as a mortgage, lien, certificate of title, or financing statement.

Information that is entitled to privacy: A *Proof of Claim* form and any attached documents must show only the last 4 digits of any social security number, an individual's tax identification number, or a financial account number, only the initials of a minor's name, and only the year of any person's date of birth. If a claim is based on delivering health care goods or services, limit the disclosure of the goods or services to avoid embarrassment or disclosure of confidential health care information. You may later be required to give more information if the trustee or someone else in interest objects to the claim.

Priority claim: A claim within a category of unsecured claims that is entitled to priority under 11 U.S.C. §507(a). These claims are paid from the available money or property in a bankruptcy case before other unsecured claims are paid. Common priority unsecured claims include alimony, child support, taxes, and certain unpaid wages.

Proof of claim: A form that shows the amount of debt the debtor owed to a creditor on the date of the bankruptcy filing. The form must be filed in the district where the case is pending.

Redaction of information: Masking, editing out, or deleting certain information to protect privacy. Filers must redact or leave out information entitled to **privacy** on the *Proof of Claim* form and any attached documents.

Secured claim under 11 U.S.C. §506(a): A claim backed by a lien on particular property of the debtor. A claim is secured to the extent that a creditor has the right to be paid from the property before other creditors are paid. The amount of a secured claim usually cannot be more than the value of the particular property on which the creditor has a lien. Any amount owed to a creditor that is more than the value of the property normally may be an unsecured claim. But exceptions exist; for example, see 11 U.S.C. § 1322(b) and the final sentence of 1325(a).

Examples of liens on property include a mortgage on real estate or a security interest in a car. A lien may be voluntarily granted by a debtor or may be obtained through a court proceeding. In some states, a court judgment may be a lien.

Setoff: Occurs when a creditor pays itself with money belonging to the debtor that it is holding, or by canceling a debt it owes to the debtor.

Unsecured claim: A claim that does not meet the requirements of a secured claim. A claim may be unsecured in part to the extent that the amount of the claim is more than the value of the property on which a creditor has a lien.

Offers to purchase a claim

Certain entities purchase claims for an amount that is less than the face value of the claims. These entities may contact creditors offering to purchase their claims. Some written communications from these entities may easily be confused with official court documentation or communications from the debtor. These entities do not represent the bankruptcy court, the bankruptcy trustee, or the debtor. A creditor has no obligation to sell its claim. However, if a creditor decides to sell its claim, any transfer of that claim is subject to Bankruptcy Rule 3001(e), any provisions of the Bankruptcy Code (11 U.S.C. § 101 et seq.) that apply, and any orders of the bankruptcy court that apply.

Please send completed Proof(s) of Claim to:

Frontier Communications Corp. Claims Processing Center
c/o Prime Clerk LLC
850 3rd Avenue, Suite 412
Brooklyn, NY 11232

Do not file these instructions with your form

UNITED STATES BANKRUPTCY COURT
SOUTHERN DISTRICT OF NEW YORK

In re:	
FRONTIER COMMUNICATIONS CORPORATION, *et al.*,[1]	**Chapter 11**
	Case No. 20-22476 (RDD)
Debtors.	**(Jointly Administered)**

ADDENDUM TO PROOF OF CLAIM
BY INTELLECTUAL VENTURES II LLC
FOR FRONTIER'S PATENT INFRINGEMENT

Intellectual Ventures II LLC ("IV") hereby files, as an unsecured priority claim, this claim against Frontier Communications Corporation ("Frontier"), and jointly and severally as to all affiliated, parent, and/or subsidiary debtors in the above-captioned proceeding, in the amount of $9,396,000 for Frontier's past infringement of patent assets held by IV.

IV'S ASSERTED PATENTS

1. IV owns all substantial right, title, and interest in the following U.S. patents (the "Asserted Patents"):

2. On November 11, 2003, United States Patent No. 6,647,068 ("the '068 Patent"), titled "Variable State Length Initialization," was duly and lawfully issued by the United States Patent and Trademark Office (the "PTO").

[1] The last four digits of Debtor Frontier Communications Corporation's tax identification number are 9596. Due to the large number of debtor entities in these chapter 11 cases, for which joint administration has been granted, a complete list of the debtor entities and the last four digits of their federal tax identification numbers are not provided herein. A complete list of such information may be obtained on the website of the Debtors' proposed claims and noticing agent at https://cases.primeclerk.com/ftr. The location of the Debtors' service address for purposes of these chapter 11 cases is: 50 Main Street, Suite 1000, White Plains, New York 10606.

3. On September 28, 2004, United States Patent No. 6,798,735 ("the '735 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

4. On September 18, 2007, United States Patent No. 7,272,171 ("the '171 Patent"), titled "Variable State Length Initialization," was duly and lawfully issued by the PTO.

5. On October 19, 2010, United States Patent No. 7,817,532 ("the '532 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

6. On February 5, 2013, United States Patent No. 8,369,275 ("the '275 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

FRONTIER'S INFRINGEMENT

7. Frontier and its affiliated, parent, and/or subsidiary debtors have infringed the Asserted Patents as follows:

8. During the period before filing its petition in the instant bankruptcy proceeding and before certain of the Asserted Patents expired (and continuing thereafter as to those Asserted Patents that have not yet expired), Frontier infringed at least claims 7, 8, 16, and 17 of the '068 Patent; claims 1, 9, and 10 of the '735 Patent; claims 2 and 3 of the '171 Patent; claims 6, 7, 8, 9, and 12 of the '532 Patent; and claim 1 of the '275 Patent under 35 U.S.C. Section 271, by Frontier's use of at least the Adtran 1248, Adtran 1148, Adtran TA5000, Adtran TA3000, Alcatel 7300, Calix E5, Calix E7, Calix C7 digital subscriber line access multiplexers (DSLAMs), implementing VDSL2 and/or ADSL2/2+ technical standards promulgated by the International Telecommunication Union (ITU-T).

9. Exemplary claim charts are attached as Exhibits A-D outlining how Frontier infringes the ’068, ’735, ’171, and ’532 Patents through Frontier’s use of products implementing particular ITU-T technical standards.

IV’S CLAIM FOR ROYALTY DAMAGES BASED ON FRONTIER’S INFRINGEMENT

10. IV is party to a Patent License Agreement executed by one of Frontier’s similarly-situated competitors, in which Frontier’s competitor agreed to license, *inter alia*, the Asserted Patents (the “Competitor License”).[2]

11. IV and Frontier’s competitor executed the Competitor License following IV’s assertion in a prior litigation of four of the five Asserted Patents against Frontier’s competitor.

12. The terms of the Competitor License are comparable to those that Frontier owes to IV as compensation for its infringement of IV’s patents.

13. Based on the royalty terms of the Competitor License, the date of Frontier’s bankruptcy petition in this proceeding, and the date of this proof of claim, Frontier owes IV a royalty of $2.71 per subscriber as compensation for Frontier’s pre-petition infringement of the Asserted Patents.

14. Frontier’s May 6, 2020 SEC 10-Q filings reports that as of March 31, 2020, Frontier had 3.48 million DSL subscribers.

15. For the period August 2014 (six years before filing of this proof of claim) through April 2020 (when Frontier filed its petition in this bankruptcy proceeding), Frontier accordingly owes to IV royalty damages of $9,396,000.

[2] The Competitor License is not submitted herewith based on a contractual confidentiality restriction. The Competitor License can be made available subject to an appropriate protective order.

16. IV reserves all rights to pursue, and intends to pursue, an administrative claim for Frontier's post-petition infringement of the '068 and '171 Patents.

17. This claim is without prejudice to any other claim that IV or its affiliates may have against Frontier and/or any affiliated, parent, and/or subsidiary debtors.

DATED: August 18, 2020

Respectfully submitted,

/s/ G. Eric Brunstad, Jr.

G. Eric Brunstad, Jr.
New York State Bar No. 2119774
eric.brunstad@dechert.com
DECHERT LLP
Three Bryan Park
1095 Avenue of the Americas
(212) 698-3500

Counsel for Creditor
Intellectual Ventures II LLC

EXHIBIT A

Exhibit A – Claim Chart for U.S. Patent No. 6,647,068
as applied to Frontier with respect to VDSL2

'068 Patent, Claim 7	**VDSL2[1]**
7. In a multicarrier transceiver, a method for variable state length initialization comprising:	**"In a multicarrier transceiver"** Products compliant with ITU-T Recommendation G.993.2 comprise a transceiver – a device that both transmits and receives. "VTU," "VTU-O," and "VTU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.993.2 (2006) § 4 (p. 10) ("VTU-O [is an abbreviation for] VTU at the Optical Network Unit (or central office, exchange, cabinet, etc., i.e., operator end of the loop)," and "VTU-R [is an abbreviation for] VTU at the Remote site (i.e., subscriber end of the loop)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.993.2 (2006) § 10.4.3 (p. 79). **10.4.3 Modulation by the inverse discrete Fourier transform (IDFT)** The IDFT is used to modulate the output of the symbol encoder onto the DMT subcarriers. It converts the *NSC* complex values Z_i (as defined in clause 10.3.4) generated by the symbol encoder (frequency domain representation) into $2N$ real values x_n ($n = 0, 1, ..., 2N-1$), which is a time domain representation. The conversion shall be performed with a $2N$ point IDFT, with $N-1 \geq MSI$, as: $$x_n = \sum_{i=0}^{2N-1} \exp\left(j \cdot 2 \cdot \pi \cdot \frac{n \cdot i}{2 \cdot N}\right) \cdot Z_i \quad \text{for } n = 0 \text{ to } 2N-1$$ A multicarrier communication system includes a first transceiver, the VTU-O and a second transceiver, the VTU-R. **"a method for variable state length initialization"** A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2, which is a variable state length initialization because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.993.2 (2006) § 12.3 (pp. 123-190).

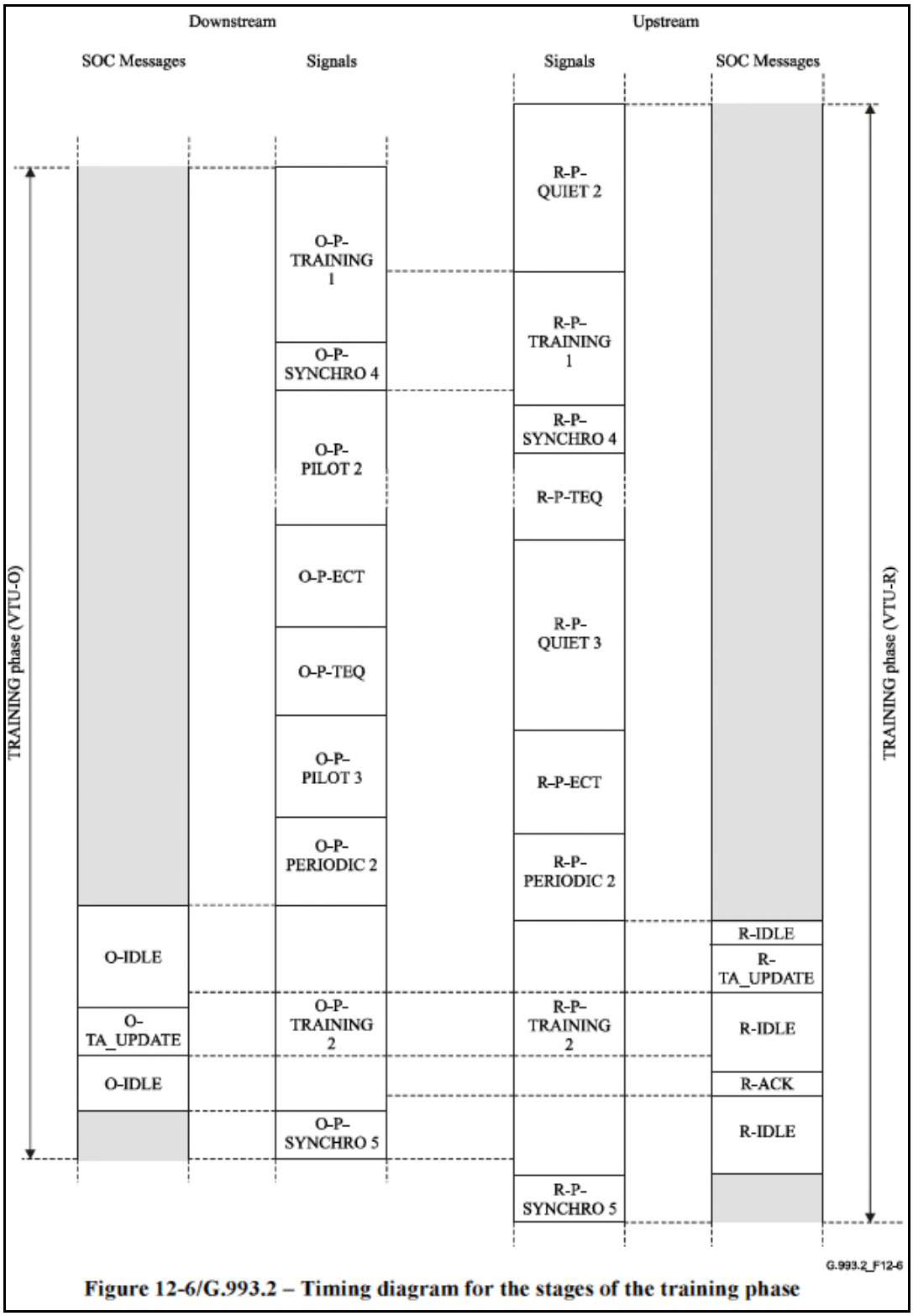
[1] Although this document cites to only VDSL2 as described in G.993.2 (2006), VDSL2 is described in various documents published by the ITU, including but not limited to:

- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 (02/2006) ("G.993.2 (2006)");
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Amendment 1, Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 – Amendment 1 (04/2007) ("G.993.2, Amendment 1");
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Amendment 3: Support for emergency rate adjustment, specification of test parameter accuracy and other improvements, Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 – Amendment 3 (08/2008) ("G.993.2, Amendment 3"); and
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2, (12/2011) ("G.993.2 (2011)").

These contentions apply equally to units implementing other versions of the ITU Recommendations (including without limitation the references limited above) where those other versions have the same/similar language as relied upon in these contentions.

'068 Patent, Claim 7	**VDSL2[1]**
[a] receiving from a second multicarrier transceiver information identifying a value that determines a minimum number of multicarrier symbols in an initialization state;	During the initialization, the VTU-O receives the message R-PRM from the VTU-R. R-PRM identifies the value in Field #11 that determines the minimum duration of the initialization state R-P-TRAINING 1 expressed as a minimum number of multicarrier symbols, $T_{MIN\text{-}R\text{-}P\text{-}Train}$. ITU-T Recommendation G.993.2 (2006) § 12.3.3.2.2.3 (p. 150). Field #11 "Minimum duration of the R-P-TRAINING 1 signal ($T_{MIN\text{-}R\text{-}P\text{-}Train}$)" indicates the minimum duration of the R-P-TRAINING 1 signal that the VTU-R shall transmit. The value, $T_{MIN\text{-}R\text{-}P\text{-}Train}$, shall be expressed in DMT symbols. The duration shall be an integer multiple of 64 symbols. The integer multiple (i.e., the duration divided by 64) shall be encoded as an 8-bit value.
[b] receiving from the second multicarrier transceiver at least the minimum number of multicarrier symbols during the initialization state; and	The VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ multicarrier symbols from the VTU-R while the VTU-R is in the R-P-TRAINING 1 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157). *See* Limitation [a]. channel discovery phase. After the VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ R-P-TRAINING 1 symbols (Field #11 of R-PRM, see clause 12.3.3.2.2.3), it shall transmit O-P-SYNCHRO 4 to indicate the start of the TEQ and EC training stages. After detecting O-P-SYNCHRO 4, the VTU-R
[c] transmitting to the second multicarrier transceiver a predefined signal allowing exit of the initialization state and entry into a new initialization state, wherein the predefined signal is sent to the second multicarrier transceiver after at least the minimum number of multicarrier symbols have been received in the initialization state.	**"transmitting to the second multicarrier transceiver a predefined signal allowing exit of the initialization state and entry into a new initialization state"** The VTU-O transmits the predefined signal O-P-SYNCHRO 4 allowing exit of the R-P-TRAINING 1 initialization state and entry into the R-P-SYNCHRO 4 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157). channel discovery phase. After the VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ R-P-TRAINING 1 symbols (Field #11 of R-PRM, see clause 12.3.3.2.2.3), it shall transmit O-P-SYNCHRO 4 to indicate the start of the TEQ and EC training stages. After detecting O-P-SYNCHRO 4, the VTU-R shall respond within a time period between 48 and 64 symbols by transmitting R-P-SYNCHRO 4. **"wherein the predefined signal is sent to the second multicarrier transceiver after at least the minimum number of multicarrier symbols have been received in the initialization state"** The VTU-O transmits O-P-SYNCHRO 4 after at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ multicarrier symbols have been received in the R-P-TRAINING 1 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157).

'068 Patent, Claim 16	VDSL2
16. In a multicarrier transceiver, a method for variable state length initialization comprising:	**"In a multicarrier transceiver"** Products compliant with ITU-T Recommendation G.993.2 comprise a transceiver – a device that both transmits and receives. "VTU," "VTU-O," and "VTU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.993.2 (2006) § 4 (p. 10) ("VTU-O [is an abbreviation for] VTU at the Optical Network Unit (or central office, exchange, cabinet, etc., i.e., operator end of the loop)," and "VTU-R [is an abbreviation for] VTU at the Remote site (i.e., subscriber end of the loop)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.993.2 (2006) § 10.4.3 (p. 79). **10.4.3 Modulation by the inverse discrete Fourier transform (IDFT)** The IDFT is used to modulate the output of the symbol encoder onto the DMT subcarriers. It converts the *NSC* complex values Z_i (as defined in clause 10.3.4) generated by the symbol encoder (frequency domain representation) into $2N$ real values x_n ($n = 0, 1, ..., 2N-1$), which is a time domain representation. The conversion shall be performed with a $2N$ point IDFT, with $N-1 \geq MSI$, as: $$x_n = \sum_{i=0}^{2N-1} \exp\left(j \cdot 2 \cdot \pi \cdot \frac{n \cdot i}{2 \cdot N}\right) \cdot Z_i \quad \text{for } n = 0 \text{ to } 2N-1$$ A multicarrier communication system includes a first transceiver, the VTU-O and a second transceiver, the VTU-R. **"a method for variable state length initialization"** A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2, which is a variable state length initialization because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.993.2 (2006) § 12.3 (pp. 123-190).
[a] receiving from a second multicarrier transceiver information identifying a value that determines a minimum number of multicarrier symbols in an initialization state;	During the initialization, the VTU-O receives the message R-PRM from the VTU-R. R-PRM identifies the value in Field #11 that determines the minimum duration of the initialization state R-P-TRAINING 1 expressed as a minimum number of multicarrier symbols, $T_{MIN\text{-}R\text{-}P\text{-}Train}$. This is also the minimum number of multicarrier symbols in the initialization state O-P-TRAINING 1 since the O-P-TRAINING 1 initialization state begins during the R-P-QUIET2 initialization state, continues through the transition to the R-P-TRAINING 1 initialization state and continues until at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ symbols of R-P-TRAINING 1 have been received. ITU-T Recommendation G.993.2 (2006) §§ 12.3.3.2.2.3 (p. 150) and 12.3.4.1 (p. 157), and Figure 12-6 (p. 156) and ITU-T Recommendation G.993.2 (2011) Figure 12-8 (p. 217). Field #11 "Minimum duration of the R-P-TRAINING 1 signal ($T_{MIN\text{-}R\text{-}P\text{-}Train}$)" indicates the minimum duration of the R-P-TRAINING 1 signal that the VTU-R shall transmit. The value, $T_{MIN\text{-}R\text{-}P\text{-}Train}$, shall be expressed in DMT symbols. The duration shall be an integer multiple of 64 symbols. The integer multiple (i.e., the duration divided by 64) shall be encoded as an 8-bit value.

'068 Patent, Claim 16	VDSL2
	channel discovery phase. After the VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ R-P-TRAINING 1 symbols (Field #11 of R-PRM, see clause 12.3.3.2.2.3), it shall transmit O-P-SYNCHRO 4 to indicate the start of the TEQ and EC training stages. After detecting O-P-SYNCHRO 4, the VTU-R
	 **Figure 12-6/G.993.2 – Timing diagram for the stages of the training phase**
[b] transmitting to the second multicarrier transceiver at least the	The VTU-O transmits at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ multicarrier symbols to the VTU-R while the VTU-O is in the O-P-TRAINING 1 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157). *See* Limitation [a].

'068 Patent, Claim 16	**VDSL2**
minimum number of multicarrier symbols during the initialization state; and	channel discovery phase. After the VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ R-P-TRAINING 1 symbols (Field #11 of R-PRM, see clause 12.3.3.2.2.3), it shall transmit O-P-SYNCHRO 4 to indicate the start of the TEQ and EC training stages. After detecting O-P-SYNCHRO 4, the VTU-R
[c] transmitting to the second multicarrier transceiver a predefined signal indicating exit from the initialization state and entry into a new initialization state, wherein the predefined signal is sent to the second multicarrier transceiver after at least the minimum number of multicarrier symbols have been received in the initialization state.	**"transmitting to the second multicarrier transceiver a predefined signal indicating exit from the initialization state and entry into a new initialization state"** The VTU-O transmits the predefined signal O-P-SYNCHRO 4 indicating exit from the O-P-TRAINING 1 initialization state and entry into the O-P-PILOT 2 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157) and § 12.3.4.1 (p. 157), and Figure 12-6 (p. 156) and ITU-T Recommendation G.993.2 (2011) Figure 12-8 (p. 217). channel discovery phase. After the VTU-O receives at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ R-P-TRAINING 1 symbols (Field #11 of R-PRM, see clause 12.3.3.2.2.3), it shall transmit O-P-SYNCHRO 4 to indicate the start of the TEQ and EC training stages. After detecting O-P-SYNCHRO 4, the VTU-R Immediately after transmission of O-P-SYNCHRO 4, the VTU-O shall transmit O-P-PILOT 2, and shall continue transmitting O-P-PILOT 2 for $T_{VTU\text{-}O\_TEQ}$ symbols. Immediately after transmission of

'068 Patent, Claim 16	VDSL2

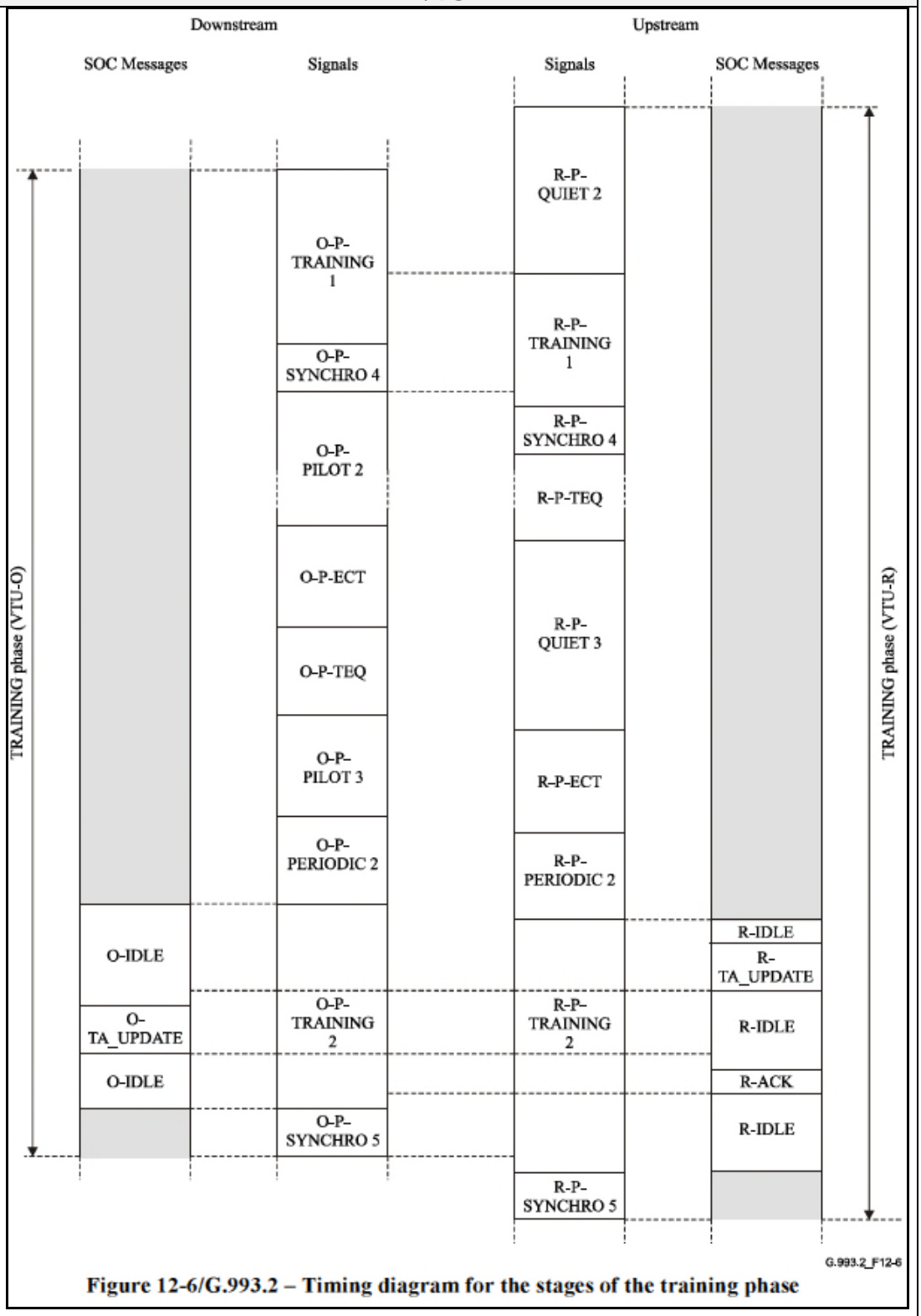


Figure 12-6/G.993.2 – Timing diagram for the stages of the training phase

"wherein the predefined signal is sent to the second multicarrier transceiver after at least the minimum number of multicarrier symbols have been received in the initialization state"

The VTU-O sends O-P-SYNCHRO 4 after at least $T_{MIN\text{-}R\text{-}P\text{-}Train}$ multicarrier symbols have been received in the O-P-TRAINING 1 initialization state. ITU-T Recommendation G.993.2 (2006) § 12.3.4.1 (p. 157).

EXHIBIT B

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

`735 Patent, Claim 1	ADSL2/+[1]
1. In a multicarrier transmission system including two communication units, a method for modulat[ing][2] bits onto subchannels of a communication channel between the two communication units, the method comprising:	This claim is infringed by an ADSL2-compliant ATU-C (in the upstream[3] direction) performing any On-line Reconfiguration operations (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning and/or Seamless Rate Adaptation). *See* ITU-T Recommendation G.992.3, January 2005 ("G.992.3 (2005)"), § 10.2 *et seq.* (describing On-line Reconfiguration operations). An ADSL2 communication system is a multicarrier transmission system with two communication units: an ADSL transceiver located at the service provider's location (called an "ATU-C") and an ADSL transceiver located at the subscriber's location (called an "ATU-R"). Both the ATU-C and the ATU-R[4] are transceivers, *i.e.*, devices that both transmit and receive. *See* G.992.3 (2005), § 4 ("Abbreviations," p. 6) (defining "ATU" as an "ADSL Transceiver Unit;" defining "ATU-C" as "ATU at the central office end (i.e. network operator);" defining "ATU-R" as "ATU at the remote terminal end (i.e., CP)"). ADSL2 transceivers (ATU-Cs) are multicarrier in nature (*i.e.*, the transceivers communicate with each other using a plurality of discrete frequency subchannels[5]), as they transmit and receive Discrete Multi-tone ("DMT," *see* G.992.3 (2005), § 4) signals carrying bits modulated across a plurality of subcarriers. *See id.* at § 8.2 (describing PMD Function[6] of transceivers as performing Modulation). *See also id.* at § 3.15 (defining "DMT symbol" as "[a] set of complex values $\{Z_i\}$ forming the frequency domain inputs to the inverse discrete Fourier transform (IDFT) (see 8.8.2); The DMT symbol is equivalently the set of real valued time samples, $\{x_n\}$, related to the set of $\{Z_i\}$ via the IDFT."); *id.* at § 3.37 (defining "subcarrier" as "[a] particular complex valued input, Z_i, to the IDFT (see 8.8.2)."); *id.* at § 8.8 ("Modulation") ("The modulator shall modulate a constellation encoder output data frame or sync frame (containing $NSC - 1$ complex values Z_i, $i = 1$ to $NSC - 1$) into a DMT symbol."). An ADSL2 transceiver (ATU-C) communicates with another transceiver in a multicarrier modulation system by transmitting and/or receiving a multicarrier signal to and/or from another transceiver. *See, e.g.*, G.992.3 (2005) §§ 8.8 (p. 89) and 8.8.1 (p. 89). *See also id.* at § 8.6.

[1] Relevant features of the ADSL2 standard are described in documents including but not limited to G.992.3 (2005) and G.992.3 (2009). These infringement contentions cite exclusively to the ADSL2 standard; however, they also apply to the ADSL2+ (G.992.5) standard. ADSL2+ is a superset of ADSL2, and the features pertinent to infringement are common to both. *See* G.992.5 ("This Recommendation is written as a delta Recommendation relative to Recommendation ITU-T Rec. G.992.3. For the clauses which have been changed, this Recommendation contains complete replacement text (unless explicitly indicated). For the clauses which have not been changed, this Recommendation contains only the clause heading, with reference to Recommendation ITU-T G.992.3.").

[2] Corrected suspected typo.

[3] In the upstream (or uplink) direction, the ATU-C receives signals transmitted by the ATU-R. *See* G.992.3 (2005), § 3.44 (p. 6).

[4] In the downstream (or downlink) direction, the ATU-R receives signals transmitted by the ATU-C. *See* G.992.3 (2005), § 3.16 (p. 4).

[5] In the context of this chart, the terms "subchannel(s)," "subcarrier(s)," "each subcarrier," and "all subcarriers" refer to the set of subcarriers with subcarrier index $i = 1$ to $NSC - 1$, where NSC is equal to NSC_{us} for upstream transmission and NSC_{ds} for downstream transmission. *See* G.992.3 (2005), § 8.5 (Table 8-4, describing "*NSC*").

[6] "PMD" refers to "Physical Media Dependent (sublayer)." *See* G.992.3 (2005) (§ 4).

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

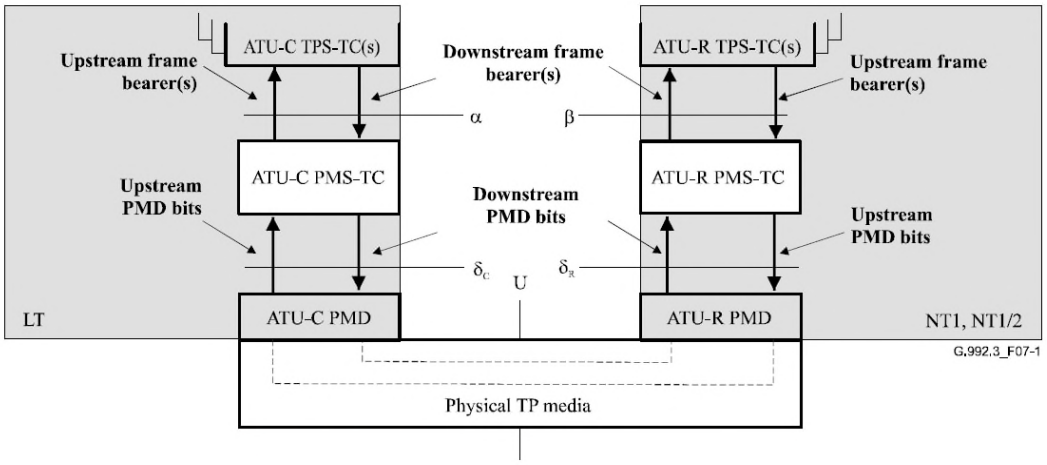
`735 Patent, Claim 1	**ADSL2/+[1]**
	In the ADSL2 multicarrier communication system, a communication link is established between an ATU-C and an ATU-R via a physical media such as a metallic twisted pair (*e.g.*, copper telephone wires). *See* G.992.3 (2005), Summary (p. i). *See id.* at § 7.1 and Figure 7-1 (p. 22).  **Figure 7-1/G.992.3 – PMS-TC transport capabilities within the user plane**
[a] allocating bits to subchannels of the communication channel according to a first bit allocation table;	An ADSL2 transceiver (ATU-C (in the upstream direction)) allocates bits to subchannels of the communication channel according to a first bit allocation table before performing On-line Reconfiguration operations (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). An ADSL2-compliant transceiver (ATU-C in the upstream direction) allocates bits to subchannels of the communication channel according to a first bit allocation table to communicate with a transceiver on the other side of the ADSL2 link. A first bit allocation table is used by the receive function of the transceiver to receive data transmissions over the link prior to the performance of an On-line Reconfiguration. The first bit allocation table is often determined during an initialization procedure with tone ordering. *See* G.992.3 (2005), § 8.6.1 (p. 74) ("During initialization, the receive PMD function shall calculate the numbers of bits and the relative gains to be used for every subcarrier . . . . The calculated bits and gains and the tone ordering shall be sent back to the transmit PMD function during a later stage of initialization . . . . The pairs of bits and relative gains are defined . . . as a bit allocation table *b* and gain table *g* . . . ."). The first bit allocation table is also sometimes determined during one or more previous On-line Reconfigurations of the channel parameters during the data communication between an ATU-C and an ATU-R, and the first bit allocation table is specified at least in part in the control parameters associated with a previous reconfiguration. *See* G.992.3 (2005), § 8.5.1 (p. 64, Table 8-4) (defining control parameters, including b_i, which comprise a bit allocation table). *See also id.* at §§ 8.16.1 & 8.17.1 (describing b_i as a control parameter associated with both On-line Reconfiguration and Power Management operations).
[b] monitoring the communication channel during transmission of the bits allocated to the	An ADSL2 transceiver (an ATU-C in the upstream direction) monitors the communication channel during transmission of the bits allocated to the subchannels according to the first bit allocation table, which enables the transceiver to perform On-line Reconfiguration operations (i.e., Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation).

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

`735 Patent, Claim 1	**ADSL2/+[1]**
subchannels according to the first bit allocation table;	Monitoring of the communication channel by an ADSL2 transceiver (ATU-C) can be performed, for example, by monitoring the conditions of signals (*e.g.*, line and noise conditions) received over the communication channel using management plane procedures. *See* G.992.3 (2005), § 8.12 *et seq.* (pp. 95–104); *see also id.* at § 8.12.3 (p. 97) (describing test parameters that can be used to monitor channel conditions of the communication channel, such as test parameter Channel Characteristics Function H(f) per subcarrier (CCF-ps), which can be used to monitor "the physical copper loop condition," and test parameter "Signal-to-Noise Ratio SNR(f) per subcarrier (SNR-ps)," which can be used to monitor "time-dependent changes in crosstalk levels and line attenuation"); *see also id.* at § 8.12.3.3 (pp. 100-01) (describing that the SNR-ps parameters of the communication channels are measured and updated autonomously by the ATU); *see also id.* at § 8.12.3.6 (p. 102) (describing that the signal-to-noise ratio margin parameters (SNRM) of the communication channels are measured and updated autonomously by the ATU unit); *See also id.* at § 9.4.1.10 (pp. 191–93) (describing the use of test parameter messages used by the ATU units for monitoring the communication channel). *See also* G.997.1 (2006), §§ 7.3.1.4, *et seq.*, 7.5.1.13, 7.5.1.14. Monitoring of the communication channel by an ADSL2 transceiver (ATU-C) can also be performed by monitoring control messages received from another ATU transceiver. For example, in a transmitter-initiated On-line Reconfiguration operation, the receiving ATU monitors control messages transmitted by the initiating ATU. *See* G.992.3 (2005), §§ 9 & 10.2.2.2 (p. 202).
[c] developing a second bit allocation table at one of the communication units in response to monitoring the communication channel;	An ADSL2 transceiver (an ATU-C in the upstream direction) develops a second bit allocation table in response to monitoring the communication channel when performing any On-line Reconfiguration operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). A second bit allocation table is used by the transceiver pair to communicate data after the performance of an OLR and/or Low Power Entry operation. During an OLR operation performed by an ADSL2 transceiver, the ADSL2 transceiver (ATU-C in the upstream direction) monitors the communication channel (*e.g.*, by monitoring the receive signal condition or control messages from another transceiver). *See* 1[b], above. In response to the monitoring, an ATU-C develops a second bit allocation table to be used by the ATUs after performing the OLR. *See* G.992.3 (2005) at §§ 8.12 & 10.2.2.1. *See also* G.997.1 (2006), §§ 7.3.1.4, *et seq.*, 7.5.1.13, 7.5.1.14.
[d] transmitting the second bit allocation table to the other of the communication units over the communication channel; and	An ADSL2 transceiver (an ATU-C in the upstream direction and/or an ATU-R in the downstream direction) transmits the second bit allocation table to the other of the communication units over the communication channel when performing any On-line Reconfiguration operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation) and/or Low Power Entry operation. An ADSL2 transceiver (an ATU-C in the upstream direction) transmits the second bit allocation table to the other transceiver for communication with the other transceiver over an ADSL2 communication link during an OLR operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning and/or Seamless Rate Adaptation). *See* G.992.3 (2005), § 8.16 (p. 166).

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

`735 Patent, Claim 1	**ADSL2/+[1]**
	An ADSL2 transceiver (ATU-C) transmits a second bit allocation table to the other transceiver when it performs one of the three types of OLR operations: bitswap, dynamic rate repartitioning, and/or seamless rate adaptation. During an OLR procedure, the ADSL2 transceiver (ATU-C) changes one or more parameters b_i, which specify the number of bits to be allocated to each subchannel of the multicarrier system (*i.e.*, the parameters b_i constitute a second bit allocation table.). *See* G.992.3 (2005), § 10.2.1 (p. 200). To transmit the second bit allocation table to the other transceiver, the receiver portion of an ADSL2 transceiver (ATU-C) sends a control message specifying the number of bits allocated to each subchannel to the transmitter portion the ADSL2 transceiver (ATU-C) on the other side of the ADSL2 link in the multicarrier system. *See* G.992.3 (2005), § 8.16.1 (p. 167) (describing "[r]econfigurable control parameters of the PMD function" as including "number of bits per subcarrier"); *id.* at § 9.4.1.1 (Table 9-7) (all OLR message Types require the receiver to send octets "describing subcarrier parameter field for each subcarrier"[7]). *See also id.* at § 9.4.1 (p. 174, Table 9-2) (describing that the on-line reconfiguration command includes "[n]ew configuration including all necessary PMS-TC and PMD control values."); *id.* at § 10.2.2.1 (pp. 222-23) (describing that in an on-line reconfiguration procedure, the receiving "ATU's control function sends the necessary control messages describing the new values of the transmit PMD function control parameters to the transmitting ATU's control function," where the "new values of the transmit PMD function control parameters" include the second bit allocation table developed by the receiving ATU as described in G.992.3 (2005), § 8.5.1 (p. 64, Table 8-4)); *id.* at § 8.5.1 (p. 64, Table 8-4) (describing that the PMD control parameters include parameters b_i, which specify the entries in the second bit allocation table). This limitation may also be met under the doctrine of equivalents.
[e] storing the first and second bit allocation tables at each of the communication units.	An ADSL2 transceiver (an ATU-C in the upstream direction) stores the first and second bit allocation tables when performing any On-line Reconfiguration operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). An ADSL2 transceiver (ATU-C) on each side of the ADSL2 communication link necessarily stores the first and second bit allocation tables when the receiving ATU develops the second bit allocation table or the transmitting ATU receives the second bit allocation table from another ATU, while the transmitting and/or receiving ATU continues transmitting and/or receiving data on the communication channel using the first bit allocation table. *See* G.992.3 (2005) at §§ 10.2.2 & 10.3.2. Before performing an OLR (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation), an ADSL2 transceiver (ATU-C) communicates data with another transceiver on the ADSL2 link using a first bit allocation table stored in the memory of the respective ATU. *See* [a] above. When performing an OLR (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation), a receiving ATU develops and stores a second bit allocation table and then transmits the second bit allocation table to the transmitting ATU, and the transmitting ATU stores the second bit allocation table for use upon reception. *See* [c] and [d] above. During the period of time between developing/transmitting a second bit allocation table until the ATUs utilize the second bit

[7] A subcarrier parameter field contains bits specifying, *inter alia*, bits allocated per subchannel. *See* G.992.3 (2005) at § 9.4.1.1.

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

`735 Patent, Claim 1	**ADSL2/+[1]**
	allocation table for modulation and transmission of bits, the ATUs necessarily are each storing a first and second bit allocation table. *See* G.992.3 (2005) at §§ 10.2.2 & 10.3.2.

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

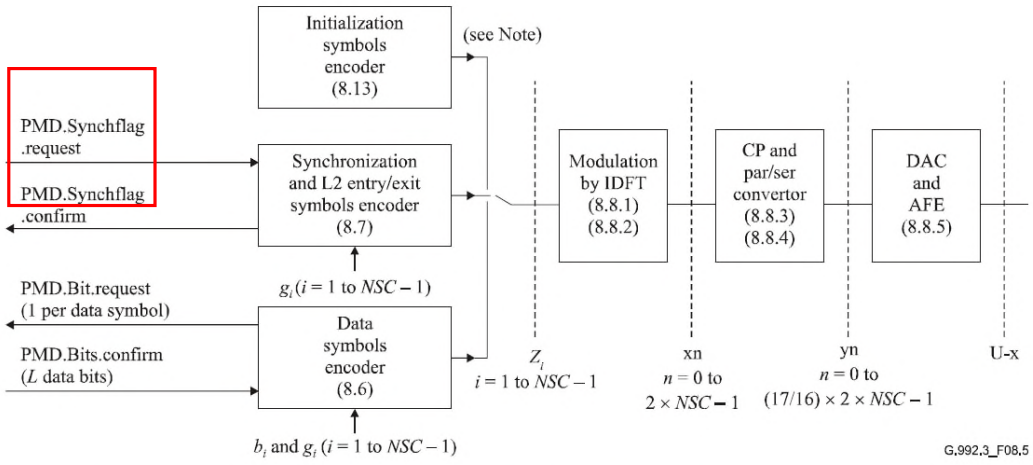
`735 Patent, Claim 9	ADSL2/+
9. The method of claim 1 further comprising receiving a flag over the communication channel to synchronize switching from the first bit allocation table to the second bit allocation table for allocating bits to subchannels.	*See* claim 1 above. This claim is infringed by an ADSL2-compliant ATU-C (in the upstream direction) performing any On-line Reconfiguration operations (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning and/or Seamless Rate Adaptation). An ADSL2 transceiver (an ATU-C in the upstream direction) receives a flag over the communication channel to synchronize switching from the first bit allocation table to the second bit allocation table for allocating bits to subchannels when performing any On-line Reconfiguration operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). An ADSL2 transceiver (an ATU-C in the upstream direction) receives a PMD.Synchflag primitive from another transceiver on the other side of the ADSL2 link during an OLR procedure (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). The ADSL2 transceiver (ATU-C) first sends an OLR command to another transceiver, and then receives a PMD.Syncflag primitive from the other transceiver in response, where the PMD.Syncflag primitive is used as a time marker to synchronize the switching from the first bit allocation table to the second bit allocation table. *See* G.992.3 (2005), § 9.4.1 (p. 174, Table 9-2) (describing response to an OLR command as including a "PMD.Synchflag primitive"). *See also id.* at § 10.2.2.1 (p. 202) (describing during an On-line Reconfiguration procedure, an ATU-C receives a PMD.Synchflag from the other transceiver's transmit PMD function.); *id.* at § 8.3 (p. 60, Table 8-1) (describing that the PMD.Synchflag is used by ADSL2 transceiver (ATU-C) to coordinate the On-line Reconfiguration procedure, including synchronizing the switching from first bit allocation table to the second bit allocation table). *See also* G.992.3 (2005), § 8.4 and Figure 8-5 (p. 202).  NOTE – The Initialization Symbols Encoder defines Z_i values for i = 1 to 2 × NSC – 1 (see 8.13.2.4). **Figure 8-5/G.992.3 – Block diagram of the transmit PMD function**

Exhibit B – Claim Chart for U.S. Patent No. 6,798,735
as applied to Frontier with respect to ADSL2/+

`735 Patent, Claim 10	**ADSL2/+**
10. The method of claim 9 further comprising commencing use of the second bit allocation table for allocating bits to subchannels at a designated frame subsequent to receipt of the flag.	*See* claim 9 above. This claim is infringed by an ADSL2-compliant ATU-C (in the upstream direction) performing any On-line Reconfiguration operations (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning and/or Seamless Rate Adaptation). An ADSL2 transceiver (an ATU-C in the upstream direction) commences use of a second bit allocation table for allocating bits to subchannels at a designated frame subsequent to receipt of the flag when performing any On-line Reconfiguration operation (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation). An ADSL2 transceiver (an ATU-C in the upstream direction) performing an OLR (*i.e.*, Bit Swapping, Dynamic Rate Repartitioning, and/or Seamless Rate Adaptation) commences use of a second bit allocation table for allocating bits to subchannels to communicate with the other transceiver (ATU-R) after four frames (*i.e.*, starting with the fifth frame) following the receipt of the PMD.Synchflag. *See* G.992.3 (2005), § 8.16.2 (p.167). *See also id.* at § 8.4 & Fig. 8-6.

EXHIBIT C

Exhibit C – Claim Chart for U.S. Patent No. 7,817,532
as applied to Frontier with respect to VDSL2

`532 Patent, Claim 6	**VDSL2[1]**
6. A method, comprising: [a] utilizing, by a transceiver, a first allocation of bits to subchannels of a multicarrier modulation system to communicate with another transceiver;	Accused instrumentalities compliant with the ITU-T Recommendation G.993.2 standard ("VDSL2-compliant") comprise a transceiver, *i.e.*, a device that both transmits and receives, that establishes a communication link with another VDSL2 transceiver via a metallic twisted pair. A VDSL2 transceiver is commonly referred to as a VTU. *See* ITU-T Recommendation G.993.2, December 2011 ("G.993.2 (2011)"), Summary (p. i); *id.* at § 4 ("Abbreviations") p. 11 (defining "VTU" as a "VDSL2 Transceiver Unit"). The VDSL transceiver located at the service provider's location is commonly called the "VTU-O" and the VDSL transceiver located at the subscriber's location is commonly called the "VTU-R." *See* G.993.2 (2011), § 4 ("Abbreviations"), p. 11 (defining "VTU" as "VDSL2 Transceiver Unit;" defining "VTU-O" as "VTU at the Optical Network Unit (or central office, exchange, cabinet, etc., i.e., operator end of the loop);" defining "VTU-R" as "VTU at the Remote site (i.e., subscriber end of the loop)"). This claim is infringed by a VTU-O (in the downstream direction) and/or VTU-R (in the upstream direction) performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, Seamless Rate Adaptation ("SRA"), and/or Save Our Showtime ("SOS")). *See* G.993.2 (2011), § 13.1 *et seq.* (describing On-line Reconfiguration operations). A VDSL transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) utilizes a first allocation of bits to subchannels of a multicarrier modulation system to communicate with another transceiver when performing On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA and/or SOS). A first allocation of bits is utilized by a VTU-O and/or VTU-R to transmit bits prior to the performance of an OLR operation. VDSL2 transceivers (VTU-O and/or VTU-R) are multicarrier in nature (*i.e.*, the transceivers communicate with each other using a plurality of discrete frequency subchannels), as they transmit and receive Discrete Multi-tone ("DMT," *see* G.993.2 (2011) at § 4) signals carrying bits modulated across a plurality of subcarriers. *See id.* at § 10.1 (describing PMD sublayer of VDSL2 transceivers, and noting: "The functional model of the PMD sublayer is presented in Figure 10-1. In the transmit direction, the PMD sublayer receives input data frames from the PMS-TC sublayer via the δ interface as specified in clause 9.1. Each data frame contains an integer number of data bits equal to L0 + L1 to be modulated onto one DMT symbol."); *id.* at

[1] Although this document cites to only VDSL2 as described in G.993.2 (2011), VDSL2 is described in various documents published by the ITU, including but not limited to:

- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 (02/2006) ("G.993.2 (2006)");
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Amendment 1, Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 – Amendment 1 (04/2007) ("G.993.2, Amendment 1");
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Amendment 3: Support for emergency rate adjustment, specification of test parameter accuracy and other improvements, Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2 – Amendment 3 (08/2008) ("G.993.2, Amendment 3"); and
- Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2), Telecommunication Standardization Sector of International Telecommunication Union (ITU-T), G.993.2, (12/2011) ("G.993.2 (2011)").

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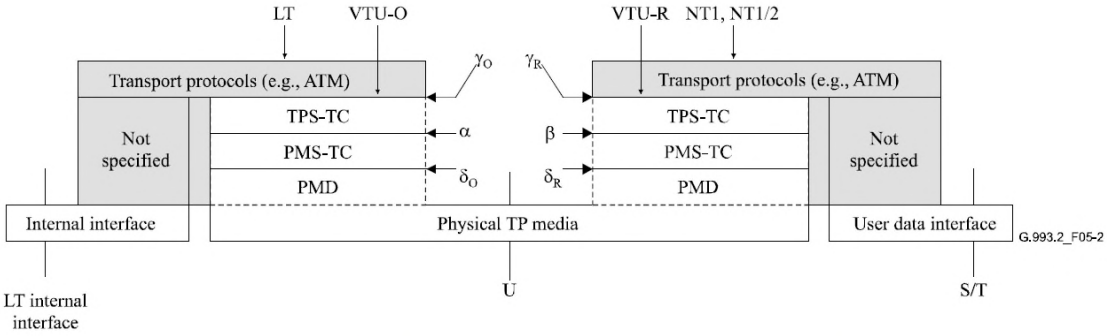
`532 Patent, Claim 6	**VDSL2[1]**
	§ 10.4.1 (under Modulation heading, describing "Data subcarriers"). *See also id.* at § 3.17 (defining "DMT symbol" as "The time-domain samples emerging from the DMT modulator during one symbol period, following insertion of the cyclic extension and completion of the windowing and overlap-and-add operations (see clause 10.4.4). During showtime, there are two types of DMT symbols: data symbols and sync symbols."); *id.* at § 3.56 (defining "subcarrier" as "A fundamental element of a discrete multi-tone (DMT) modulator. The modulator partitions the channel bandwidth into a set of parallel subchannels. The centre frequency of each subchannel is a subcarrier, onto which bits may be modulated for transmission over a channel (see clause 10)."). A VDSL2 transceiver (VTU-O and/or VTU-R) communicates with another VDSL2 transceiver in a multicarrier modulation system by transmitting and/or receiving a multicarrier signal to and/or from another transceiver. *See, e.g.*, G.993.2 (2011), §§ 10.4.1 – 10.4.3 (pp. 93-94) (describing that the data subcarriers are "indexed from *i*=0 to *i=MSI*," and "[t]he IDFT is used to modulate the output of the symbol encoder to the DMT subcarriers."). *See also id.* at §§ 10.3 *et seq.* and 10.4 *et seq.* A VDSL2 transceiver (VTU-O and/or VTU-R) communicates with another VDSL2 transceiver (VTU-R and/or VTU-O) through a physical media such as a metallic twisted pair. *See, e.g.*, G.993.2 (2011), §§ 5.2-5.4 (pp. 13-19) and Figure 5-2 (p. 13).  **Figure 5-2 – User plane protocol reference model** A VDSL transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) utilizes a first allocation of bits to subchannels of a multicarrier modulation system to communicate with another transceiver when performing On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA and/or SOS). A first allocation of bits is utilized by a VTU-O and/or VTU-R to transmit bits prior to the performance of an OLR operation. The first allocation of bits to subchannels is often determined during an initialization procedure. *See* G.993.2 (2011), § 10.3.1 (p. 78) ("During initialization, the receive PMD function shall calculate the numbers of bits and the relative gains to be used for every subcarrier. . . . The calculated bits and gains and the tone ordering shall be sent back to the transmit PMD function during the channel analysis and exchange phase of initialization. . . . The pairs of bits and relative gains are defined . . . as a bit allocation table *b* and gain table *g*. (*i.e.*, b_i and g_i, for all subcarrier indices *i* that belong to the MEDLEY set)."). The first allocation of bits is also sometimes determined by a previous reconfiguration of the subchannel parameters during data communication between a VTU-O and a VTU-R, wherein

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`532 Patent, Claim 6	**VDSL2[1]**
	the first allocation of bits to subchannels is specified at least in part by the control parameters associated with a previous reconfiguration. *See* G.993.2 (2011), § 13.2.1 (p. 276, Table 13-1) (describing reconfigurable control parameters of the PMD function, including b_i).
[b] selecting, by the transceiver, a different allocation of bits to subchannels of the multicarrier modulation system;	A VTU-O (in the downstream direction) and/or a VTU-R (in the upstream direction) select a different allocation of bits to subchannels of the multicarrier modulation system when performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA, and/or SOS). A different allocation of bits is an allocation of bits to subcarriers that differs in some way from the previous allocation of bits and is selected as part of the performance of an OLR operation. A VDSL2 transceiver (VTU-O in the downstream direction and/or a VTU-R in the upstream direction) selects a second/different allocation of bits to subchannels for communication with a transceiver on the other side of a VDSL2 link during an OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS). *See* G.993.2 (2011), § 13.1 *et seq.* The VTU-R and VTU-O are programmed to perform a variety of OLR operations (including Bit Swapping, SRA, and/or SOS) that change transmission parameters. *See id.* at § 13.1 *et seq.* These operations transmission parameters including, *inter alia*, the number of bits per subcarrier (b_i) and the fine gain for each subcarrier (g_i). *See id.* During an OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a VTU-O (in the downstream direction) and/or a VTU-R (in the downstream direction) determines and selects a different allocation of bits to subchannels by selecting new b_i parameters, which specify the number of bits to be allocated to each subchannel of the multicarrier system. *See* G.993.2 (2011), at § 13.2.1 (p. 276, Table 13-1) (describing reconfigurable control parameters of the PMD function, including b_i). During an OLR procedure, a VTU-O in the downstream direction and/or a VTU-R in the upstream direction receive an OLR command requesting and specifying a change in parameters from the other transceiver, including, *inter alia*, a different allocation of bits to subchannels. *See id.* at § 11.2.3.3. When the VTU-O in the downstream direction and/or the VTU-R in the upstream direction determines that it can comply with the requested change in parameters, it selects the requested different allocation of bits to subchannels, which selection is confirmed to the other transceiver with a Syncflag. *See id.* at § 11.2.3.2 (Table 11-2)
[c] transmitting, by the transceiver, a flag to the other transceiver; and	A VTU-O (in the downstream direction) and/or a VTU-R (in the upstream direction) transmit a flag to the other transceiver when performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA, and/or SOS). A VDSL2 transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) transmits a Syncflag to the other transceiver on the other side of the VDSL2 link during an On-line Reconfiguration (OLR) procedure (*i.e.*, Bit Swapping, SRA, and/or SOS). During an OLR procedure, a transceiver (VTU-O in the downstream direction and/or VTU-R in the upstream direction) first receives an OLR command from the other transceiver, and then responds with a Syncflag message, where the Syncflag is used as a time marker for a transition. *See* G.993.2 (2011), § 11.2.3.2 (p.103, Table 11-2) (describing a response to an OLR command as including a "Syncflag" for "marking the instant of re-configuration"). *See also id.* at § 11.2.3.3 (describing that in response to an OLR command, a VTU should either reject the request with reason codes "or positively acknowledge the initiator's request by transmitting a time marker for the reconfiguration. The time marker shall be communicated by transmission of a Syncflag (see clause 10.5.3).”).

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as applied to Frontier with respect to VDSL2

`532 Patent, Claim 6	**VDSL2[1]**
[d] utilizing, by the transceiver, the different allocation of bits to communicate with the other transceiver after a predetermined number of frames following transmission of the flag.	A VTU-O (in the downstream direction) and/or a VTU-R (in the upstream direction) utilize the different allocation of bits to communicate with the other transceiver after a predetermined number of frames following transmission of the flag when performing any On-line Reconfiguration ("OLR") operation (*i.e.*, Bit Swapping, SRA, and/or SOS). A VDSL2 transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) performing a type 1 OLR (*i.e.*, Bit Swapping), utilizes the different allocation of bits to communicate with the other transceiver after 9 frames (*i.e.*, starting with the ***tenth frame***) following the transmission of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2. A VDSL2 transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) performing a type 3 OLR (*i.e.*, SRA), utilizes the different allocation of bits to communicate with the other transceiver after 65 frames (*i.e.*, starting with the ***66th frame***) following the transmission of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2. A VDSL2 transceiver (a VTU-O in the downstream direction and/or a VTU-R in the upstream direction) performing a type 4 OLR (*i.e.*, SOS), utilizes the different allocation of bits to communicate with the other transceiver after 65 frames (*i.e.*, starting with the ***66th frame***) following the transmission of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2.

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`532 Patent, Claim 7	**VDSL2**
7. The method of claim 6, further comprising receiving the different allocation of bits from the other transceiver.	*See* discussions of claim 6, above. This claim is infringed by a VTU-O and/or VTU-R performing an On-Line Reconfiguration ("OLR") operation (*i.e.*, Bit Swapping, SRA, and/or SOS). *See* G.993.2 (2011), § 13.1 *et seq.* (describing On-line Reconfiguration operations). During an OLR operation, a VTU-O (in the downstream direction) and/or a VTU-R (in the upstream direction) receive the different allocation of bits from the other transceiver. During an OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a VDSL2 transceiver (VTU-O in the downstream direction and/or VTU-R in the upstream direction) receives an OLR command from another transceiver on the other side of the VDSL2 link. The received OLR command includes all necessary PMD control values, which includes the different allocation of bits. *See* G.993.2 (2011), § 11.2.3.2 (p.103, Table 11-2) (describing an OLR command as containing "[a]ll the necessary PMD and PMS-TC control parameter values for the new configuration," including the different allocation of bits.). The OLR command received by the transmitter portion of the VTU-O and/or VTU-R includes a plurality of octets describing subcarrier parameter fields for each subcarrier of the VDSL2 multicarrier system, where the subcarrier parameter fields describe the different allocation of bits for the transceiver. *See* G.993.2 (2011), § 11.2.3.3 (pp.106-107, Table 11-6) (type 1 (Bitswap) and type 3 (SRA) OLR commands include "4 x N_f octets describing subcarrier parameter field for each subcarrier" is defined as being sent by the receiver; type 4 (SOS) OLR command include "4 to $N_{TG}/2+3$" octets describing the changes of each element b_i in the bit allocation table *b*). *See also id.*, p.108 (describing that the subcarrier parameter fields in the OLR message received by a VTU-O and/or VTU-R "shall contain 4 octets formatted as [0000 iiii iiii iiii gggg gggg gggg bbbb] to convey the g_i (12 bits) and the b_i (4 bits) values of the subcarrier index *i* (12 bits)," where parameters b_i specify the different allocation of bits for the transceiver.); G.993.2 (2011), § 13.4 (p.280) (describing that during a receiver initiated OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a transmitting VTU (VTU-O and/or VTU-R) receives "necessary changes in related parameters (e.g., bits and gains table)" from the receiving VTU.).

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`532 Patent, Claim 9	**VDSL2**
9. A method, comprising: [a] utilizing, by a transceiver, a first allocation of bits to subchannels of a multicarrier modulation system to communicate with another transceiver;	Accused instrumentalities compliant with the ITU-T Recommendation G.993.2 standard ("VDSL2-compliant") comprise a transceiver, *i.e.*, a device that both transmits and receives, that establishes a communication link with another VDSL2 transceiver via a metallic twisted pair. A VDSL2 transceiver is commonly referred to as a VTU. *See* ITU-T Recommendation G.993.2, December 2011 ("G.993.2 (2011)"), Summary (p. i); *id.* at § 4 ("Abbreviations") p. 11 (defining "VTU" as a "VDSL2 Transceiver Unit"). The VDSL transceiver located at the service provider's location is commonly called the "VTU-O" and the VDSL transceiver located at the subscriber's location is commonly called the "VTU-R." *See* G.993.2 (2011), § 4 ("Abbreviations"), p. 11 (defining "VTU" as "VDSL2 Transceiver Unit;" defining "VTU-O" as "VTU at the Optical Network Unit (or central office, exchange, cabinet, etc., i.e., operator end of the loop);" defining "VTU-R" as "VTU at the Remote site (i.e., subscriber end of the loop)"). This claim is infringed by a VTU-O (in the upstream direction) and/or VTU-R (in the downstream direction) performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, Seamless Rate Adaptation ("SRA"), and/or Save Our Showtime ("SOS")). *See* G.993.2 (2011), § 13.1 *et seq.* (describing On-line Reconfiguration operations). A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) utilizes a first allocation of bits to subchannels of a multicarrier modulation system to communicate with another transceiver when performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA, and/or SOS). A first allocation of bits is utilized by a VTU-O and/or VTU-R to transmit bits prior to the performance of an OLR operation. The first allocation of bits to subchannels is often determined during an initialization procedure. *See* G.993.2 (2011), § 10.3.1 (p. 78) ("During initialization, the receive PMD function shall calculate the numbers of bits and the relative gains to be used for every subcarrier. . . . The calculated bits and gains and the tone ordering shall be sent back to the transmit PMD function during the channel analysis and exchange phase of initialization. . . . The pairs of bits and relative gains are defined . . . as a bit allocation table *b* and gain table *g*. (*i.e.*, b_i and g_i, for all subcarrier indices *i* that belong to the MEDLEY set)."). The first allocation of bits is also sometimes determined by a previous reconfiguration of the subchannel parameters during data communication between a VTU-O and a VTU-R, wherein the first allocation of bits to subchannels is specified at least in part by the control parameters associated with a previous reconfiguration. *See* G.993.2 (2011), § 13.2.1 (p. 276, Table 13-1) (describing reconfigurable control parameters of the PMD function, including b_i). VDSL2 transceivers (VTU-O and/or VTU-R) are multicarrier in nature (*i.e.*, the transceivers communicate with each other using a plurality of discrete frequency subchannels), as they transmit and receive Discrete Multi-tone ("DMT," *see* G.993.2 (2011) at § 4) signals carrying bits modulated across a plurality of subcarriers. *See id.* at § 10.1 (describing PMD sublayer of VDSL2 transceivers, and noting: "The functional model of the PMD sublayer is presented in Figure 10-1. In the transmit direction, the PMD sublayer receives input data frames from the PMS-TC sublayer via the δ interface as specified in clause 9.1. Each data frame contains an integer number of data bits equal to L0 + L1 to be modulated onto one DMT symbol."); *id.* at § 10.4.1 (under Modulation heading, describing "Data subcarriers"). *See also id.* at § 3.17 (defining "DMT symbol" as "The time-domain samples emerging from the DMT modulator during one symbol period, following insertion of the cyclic extension and completion of the

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as applied to Frontier with respect to VDSL2

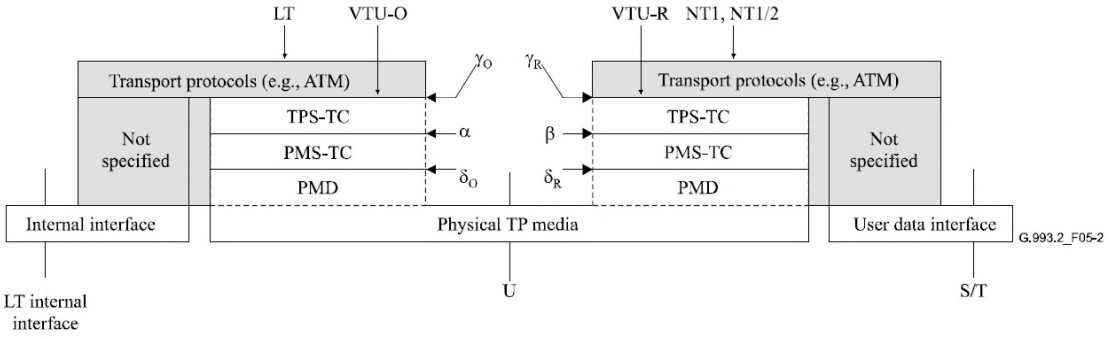
`532 Patent, Claim 9	VDSL2
	windowing and overlap-and-add operations (see clause 10.4.4). During showtime, there are two types of DMT symbols: data symbols and sync symbols."); *id.* at § 3.56 (defining "subcarrier" as "A fundamental element of a discrete multi-tone (DMT) modulator. The modulator partitions the channel bandwidth into a set of parallel subchannels. The centre frequency of each subchannel is a subcarrier, onto which bits may be modulated for transmission over a channel (see clause 10)."). A VDSL2 transceiver (VTU-O and/or VTU-R) communicates with another VDSL2 transceiver in a multicarrier modulation system by transmitting and/or receiving a multicarrier signal to and/or from another transceiver. *See, e.g.*, G.993.2 (2011), §§ 10.4.1 – 10.4.3 (pp. 93-94) (describing that the data subcarriers are "indexed from i=0 to i=*MSI*," and "[t]he IDFT is used to modulate the output of the symbol encoder to the DMT subcarriers."). *See also id.* at §§ 10.3 *et seq.* and 10.4 *et seq.* A VDSL2 transceiver (VTU-O and/or VTU-R) communicates with another VDSL2 transceiver (VTU-R and/or VTU-O) through a physical media such as a metallic twisted pair. *See, e.g.*, G.993.2 (2011), §§ 5.2-5.4 (pp. 13-19) and Figure 5-2 (p. 13).  **Figure 5-2 – User plane protocol reference model**
[b] selecting, by the transceiver, a different allocation of bits to subchannels; and	A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) selects a different allocation of bits to subchannels when performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA, and/or SOS). An allocation of bits to subcarriers that differs in some way from the previous allocation of bits is selected as part of the performance of an OLR operation. The VTU-R and VTU-O are programmed to perform a variety of OLR operations (including Bit Swapping, SRA, and/or SOS) that change transmission parameters. *See* G.993.2 (2011) at § 13.1 *et seq.* These operations changes transmission parameters including, *inter alia*, the bits per subcarrier (b_i) and the fine gain for each subcarrier (g_i). *See id.* During an OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a VDSL2 transceiver (VTU-O in the upstream direction and/or a VTU-R in the downstream direction) determines and selects a different allocation of bits to subchannels, by selecting new b_i parameters, which specify the number of bits to be allocated to each subchannel of the multicarrier system. *See* G.993.2 (2011), at § 13.2.1 (p. 276, Table 13-1) (describing reconfigurable control parameters of the PMD function, including b_i). A VTU-O in the upstream direction and/or a VTU-R in the downstream direction first determines the different allocation of bits to subchannels to be used, and then sends the different allocation of bits to the other transceiver in the communications link. *See id.* at § 11.2.3.3. Upon receiving acknowledgment from the other

Exhibit C – Claim Chart for U.S. Patent No. 7,817,532
as applied to Frontier with respect to VDSL2

`532 Patent, Claim 9	**VDSL2**
	transceiver in the form of a Syncflag, a VTU-O in the upstream direction and/or a VTU-R in the downstream direction selects the different allocation of bits to be subsequently utilized for communication. *See id.* at § 11.2.3.2 (Table 11-2); *id.* at § 13.3.
[c] utilizing, by the transceiver upon reception of a flag from the other transceiver, the different allocation of bits to subchannels to communicate with the other transceiver after a predetermined number of frames following the reception of the flag.	A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) unitizes, upon reception of a flag from the other transceiver, a different allocation of bits to subchannels to communicate with the other transceiver after a predetermined number of frames following the reception of the flag, when performing any On-line Reconfiguration ("OLR") operation (*i.e.*, Bit Swapping, SRA, and/or SOS). During an OLR procedure, a flag message is used to coordinate a time for VDSL2 transceivers (VTU-O and VTU-R) to start utilizing the different allocation of bits. The flag received by a VDSL2 transceiver (VTU-O in the upstream direction and/or a VTU-R in the downstream direction) during an OLR procedure comprises a Syncflag message from the other VDSL2 transceiver on the other side of the communication link. During an OLR procedure, a transceiver (VTU-O in the upstream direction and/or VTU-R in the downstream direction) first transmits an OLR command to the other transceiver, and then receives a Syncflag message from the other transceiver in response, where the Syncflag is used as a time marker for a transition. *See* G.993.2 (2011), § 11.2.3.2 (p.103, Table 11-2) (describing a response to an OLR command as including a "Syncflag" for "marking the instant of re-configuration"). *See also id.* at § 11.2.3.3 (describing that in response to an OLR command, a VTU should either reject the request with reason codes "or positively acknowledge the initiator's request by transmitting a time marker for the reconfiguration. The time marker shall be communicated by transmission of a Syncflag (see clause 10.5.3)."). A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) performing a type 1 OLR (*i.e.*, Bit Swapping), utilizes a different allocation of bits to communicate with the other transceiver after 9 frames (*i.e.*, starting with the ***tenth frame***) following the reception of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2. A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) performing a type 3 OLR (*i.e.*, SRA), utilizes a different allocation of bits to communicate with the other transceiver after 65 frames (*i.e.*, starting with the ***66th frame***) following the reception of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2. A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) performing a type 4 OLR (*i.e.*, SOS), utilizes a different allocation of bits to communicate with the other transceiver after 65 frames (*i.e.*, starting with the ***66th frame***) following the reception of the Syncflag. *See* G.993.2 (2011) at § 13.3 (p.278); *id.* at § 11.2.3.3 (pp.106-107, Table 11-6) (describing different types of OLR comments sent by the initiating VTU). *See also id.* at § 10.2 & Fig. 10-2.

Exhibit C – Claim Chart for U.S. Patent No. 7,817,532
as applied to Frontier with respect to VDSL2

`532 Patent, Claim 12	**VDSL2**
12. The method of claim 9, further comprising transmitting, by the transceiver, the second allocation of bits to the other transceiver based at least on a monitored state of the multicarrier modulation system.	*See* discussion of claim 9, above. This claim is infringed by a VTU-O (in the upstream direction) and/or VTU-R (in the downstream direction) performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, Seamless Rate Adaptation ("SRA"), and/or Save Our Showtime ("SOS")). *See* G.993.2 (2011), § 13.1 *et seq.* (describing On-line Reconfiguration operations). A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) transmits the second allocation of bits to the other transceiver based at least on a monitored state of the multicarrier modulation system when performing any On-line Reconfiguration (OLR) operation (*i.e.*, Bit Swapping, SRA, and/or SOS). A VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) transmits the second allocation of bits to the other transceiver. During an OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) transmits an OLR command to another transceiver on the other side of the VDSL2 link. The transmitted OLR command includes all necessary PMD control values, which includes a second allocation of bits. *See* G.993.2 (2011), § 11.2.3.2 (p.103, Table 11-2) (describing an OLR command as containing "[a]ll the necessary PMD and PMS-TC control parameter values for the new configuration," including the second allocation of bits.). The OLR command transmitted by the transmitter portion of the transceiver (VTU-O in the upstream direction and/or VTU-R in the downstream direction) includes a plurality of octets[2] describing subcarrier parameter fields for each subcarrier of the VDSL2 multicarrier system, where the subcarrier parameter fields describe the second allocation of bits for the transceiver. *See* G.993.2 (2011), § 11.2.3.3 (pp.106-107, Table 11-6) (type 1 (Bitswap) and type 3 (SRA) OLR commands include "4 x N_f octets describing subcarrier parameter field for each subcarrier" is defined as being sent by the receiver; type 4 (SOS) OLR command include "4 to $N_{TG}/2+3$" octets describing the changes of each element b_i in the bit allocation table *b*). *See also id.*, p.108 (describing that the subcarrier parameter fields in the OLR message received by a VTU-O and/or VTU-R "shall contain 4 octets formatted as [0000 iiii iiii iiii gggg gggg gggg bbbb] to convey the g_i (12 bits) and the b_i (4 bits) values of the subcarrier index *i* (12 bits)," where parameters b_i specify the different allocation of bits for the transceiver.); *id.* at § 13.4 (p.280) (describing that during a receiver initiated OLR procedure (*i.e.*, Bit Swapping, SRA, and/or SOS), a transmitting VTU (VTU-O and/or VTU-R) receives "necessary changes in related parameters (e.g., bits and gains table)" from the receiving VTU.). Transmission of a different allocation of bits by a VDSL2 transceiver (a VTU-O in the upstream direction and/or a VTU-R in the downstream direction) to another transceiver based at least on a monitored state of the multicarrier modulation system. When performing and OLR operation (*i.e.*, Bit Swapping, SRA, and/or SOS), a VDSL2 transceiver (VTU-O in the upstream direction and/or VTU-R in the downstream direction) monitors the state of the multicarrier modulation system and selects and transmits a

[2] An octet is a group of eight bits, also commonly referred to as a "byte."

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`532 Patent, Claim 12	VDSL2
	second/different allocation of bits based on the monitored state. Monitoring of the state of the multicarrier modulation system by a VDSL2 transceiver (VTU-O in the upstream direction and/or VTU-R in the downstream direction) can be performed, for example, by monitoring the conditions of signals (*e.g.*, line and noise conditions) received over the communication channel using operation and maintenance (OAM) parameters. *See* G.993.2 (2011), § 11.4 (pp. 132–163); *see also id.* at § 11.4.1 (pp. 132-133) (describing that test parameters can be used to monitor channel conditions of the communication channel, such as test parameter Channel Characteristics Function H(f) per subcarrier (CCF-ps), which can be used to monitor "the physical copper loop condition," test parameter "Quiet Line Noise PSD QLN(f) per subcarrier (QLN-ps)," which can be used to monitor "the crosstalk," and test parameter "Signal-to-Noise Ratio SNR(f) per subcarrier (SNR-ps)," which can be used to monitor "time-dependent changes in crosstalk levels and line attenuation . . ."). *See also* G.997.1 (2006), §§ 7.3.1.4, *et seq.*, 7.5.1.13, 7.5.1.14. Selecting a different allocation of bits in response to monitoring the multicarrier modulation system may also be performed according to an "SRA upshift procedure" or "SRA downshift procedure." *See id.* at § 13.4.

EXHIBIT D

Exhibit D – Claim Chart for U.S. Patent No. 7,272,171
as applied to Frontier with respect to ADSL2/+

'171 Patent, Claim 2	**ADSL2/+[1]**
2. [**Infringement Scenario #1**] In a multicarrier transceiver, a variable state length initialization method comprising:	Products compliant with the ITU-T Recommendation G.992.3 standard comprise a transceiver – a device that both transmits and receives – that establishes a communication link with a transceiver of another product compliant with the ITU-T Recommendation G.992.3 standard using a prescribed method. ITU-T Recommendation G.992.3 (2005) Summary (p. i). "ATU," "ATU-C," and "ATU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.992.3 (2005) § 4 (p. 6) ("ATU-C [is an abbreviation for] ATU at the central office end (i.e., network operator)," and "ATU-R [is an abbreviation for] ATU at the remote terminal end (i.e., CP)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.992.3 (2005) §§ 8.8 (p. 89) and 8.8.1 (p. 89). **8.8 Modulation** The modulator shall modulate a constellation encoder output data frame or sync frame (containing $NSC-1$ complex values Z_i, $i=1$ to $NSC-1$) into a DMT symbol. The data frame can be taken **8.8.1 Subcarriers** A DMT symbol consists of a set of subcarriers, with index $i=0$ to NSC. The DMT subcarriers spacing Δf, shall be 4.3125 kHz, with a tolerance of ± 50 ppm. The subcarrier frequencies shall be An ATU-C establishes a communication link with an ATU-R. ITU-T Recommendation G.992.3 (2005) § 8.13.1.1 (p. 104). **8.13.1.1 Basic functions of initialization** ADSL transceiver initialization is required in order for a physically connected ATU-R and ATU-C pair to establish a communications link. The procedures for initiating a connection are specified in A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2 for both full (§ 8.13) and short (§ 8.14) initialization, which are variable state length initializations because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.992.3 (2005) § 8.13.7 (p. 143).
[a] transmitting to a second multicarrier transceiver information identifying a first value that is used to determine a	The ATU-C transmits the information C-MSG1 that identifies a first value (CA-MEDLEYus). This first value is used to determine a first minimum number of multicarrier symbols, 512 * CA-MEDLEYus. ITU-T Recommendation G.992.3 (2005) § 8.5.3.2 (p. 69) and Table 8-12 (p. 70).

[1] Relevant features of the ADSL2 standard are described in documents including but not limited to G.992.3 (2005) and G.992.3 (2009). These infringement contentions cite to the ADSL2 standard; however, they also apply to the ADSL2+ (G.992.5) standard. ADSL2+ is a superset of ADSL2, and the features pertinent to infringement are common to both. *See* G.992.5 ("This Recommendation is written as a delta Recommendation relative to Recommendation ITU-T Rec. G.992.3. For the clauses which have been changed, this Recommendation contains complete replacement text (unless explicitly indicated). For the clauses which have not been changed, this Recommendation contains only the clause heading, with reference to Recommendation ITU-T G.992.3.").

'171 Patent, Claim 2	ADSL2/+[1]
first minimum number of multicarrier symbols;	The value *CA-MEDLEY* represents the minimum duration (in multiples of 512 symbols) of the MEDLEY state during the Initialization Channel Analysis Phase. It can be different for the ATU-C (*CA-MEDLEYus* indicates the minimum length of the R-MEDLEY state) and the ATU-R (*CA-MEDLEYds* indicates the minimum length of the C-MEDLEY state). See 8.13.5.1.4 and 8.13.5.2.4. The PMD function control parameters exchanged in the C-MSG1 message are listed in Table 8-12. **Table 8-12/G.992.3 – PMD function control parameters included in C-MSG1** **Octet Nr [i]** / **Parameter** / **PMD format** bits [8 × i + 7 to 8 × i + 0] 0 — *TARSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 1 — *TARSNRMds* (MSB) — [0000 00xx], bit 8 2 — *MINSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 3 — *MINSNRMds* (MSB) — [0000 000x], bit 8 4 — *MAXSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 5 — *MAXSNRMds* (MSB) — [0000 000x], bit 8 6 — *RA-MODEds* — [0000 00xx], bit 1 to 0 7 — *PM-MODE* — [0000 00xx], bit 1 to 0 8 — *RA-USNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 9 — *RA-USNRMds* (MSB) — [0000 000x], bit 8 10 — *RA-UTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 11 — *RA-UTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 12 — *RA-DSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 13 — *RA-DSNRMds* (MSB) — [0000 000x], bit 8 14 — *RA-DTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 15 — *RA-DTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 16 — *BIMAXds* — [0000 xxxx], bit 3 to 0 17 — *EXTGIds* — [xxxx xxxx], bit 7 to 0 18 — *CA-MEDLEYus* — [00xx xxxx], bit 5 to 0
[b] receiving from the second multicarrier transceiver information identifying a second value that is used to determine a second minimum number of multicarrier symbols;	The ATU-C receives the information R-MSG1 that identifies a second value (CA-MEDLEYds). This second value is used to determine a second minimum number of multicarrier symbols, 512 * CA-MEDLEYds. ITU-T Recommendation G.992.3 (2005) §§ 8.5.3.2 (p. 69) and 8.5.3.2 (p. 70), and Table 8-13 (p. 70). The value *CA-MEDLEY* represents the minimum duration (in multiples of 512 symbols) of the MEDLEY state during the Initialization Channel Analysis Phase. It can be different for the ATU-C (*CA-MEDLEYus* indicates the minimum length of the R-MEDLEY state) and the ATU-R (*CA-MEDLEYds* indicates the minimum length of the C-MEDLEY state). See 8.13.5.1.4 and 8.13.5.2.4. The PMD function control parameters exchanged in the C-MSG1 message are listed in Table 8-12. The PMD function control parameters exchanged in the R-MSG1 message are listed in Table 8-13.

'171 Patent, Claim 2	ADSL2/+[1]
	Table 8-13/G.992.3 – PMD function control parameters included in R-MSG1 **Octet Nr [i] / Parameter / PMD format bits [8 × i + 7 to 8 × i + 0]** 0 — *BIMAXus* — [0000 xxxx], bit 3 to 0 1 — *EXTGIus* — [xxxx xxxx], bit 7 to 0 2 — *CA-MEDLEYds* — [00xx xxxx], bit 5 to 0
[c] selecting the greater of the first minimum number of multicarrier symbols and the second minimum number of multicarrier symbols; and	The ATU-C selects the greater of CA-MEDLEYus and CA-MEDLEYds as the value for LEN_MEDLEY. ITU-T Recommendation G.992.3 (2005) § 8.13.5.1.4 (p. 135). symbols. The value *LEN_MEDLEY* shall be the maximum of the CA-MEDLEYus and CA-MEDLEYds values indicated by the ATU-C and the ATU-R in the C-MSG1 and R-MSG1 messages respectively. The value *LEN_MEDLEY* shall be a multiple of 512 and shall be less than or As explained in Sections 8.13.5.1.4 and 8.13.5.2.4, the value of LEN_MEDLEY is the maximum of CA-MEDLEYus, which is part of the C-MSG1 message, and CA-MEDLEYds, which is part of the R-MSG1 message. *See* ITU-T Recommendation G.992.3 (2005) Tables 8-12 (p. 70) and 8-13 (p. 70). **Table 8-12/G.992.3 – PMD function control parameters included in C-MSG1** **Octet Nr [i] / Parameter / PMD format bits [8 × i + 7 to 8 × i + 0]** 0 — *TARSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 1 — *TARSNRMds* (MSB) — [0000 00xx], bit 8 2 — *MINSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 3 — *MINSNRMds* (MSB) — [0000 000x], bit 8 4 — *MAXSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 5 — *MAXSNRMds* (MSB) — [0000 000x], bit 8 6 — *RA-MODEds* — [0000 00xx], bit 1 to 0 7 — *PM-MODE* — [0000 00xx], bit 1 to 0 8 — *RA-USNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 9 — *RA-USNRMds* (MSB) — [0000 000x], bit 8 10 — *RA-UTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 11 — *RA-UTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 12 — *RA-DSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 13 — *RA-DSNRMds* (MSB) — [0000 000x], bit 8 14 — *RA-DTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 15 — *RA-DTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 16 — *BIMAXds* — [0000 xxxx], bit 3 to 0 17 — *EXTGIds* — [xxxx xxxx], bit 7 to 0 18 — *CA-MEDLEYus* — [00xx xxxx], bit 5 to 0
[d] transmitting to the second multicarrier transceiver, during an initialization state, the selected number of	The ATU-C transmits the selected number (LEN_MEDLEY) of multicarrier symbols during the C-MEDLEY initialization state. ITU-T Recommendation G.992.3 (2005) § 8.13.5.1.4 (p. 135).

'171 Patent, Claim 2	ADSL2/+[1]
multicarrier symbols.	**8.13.5.1.4 C-MEDLEY** The C-MEDLEY state is of fixed length. In this state, the ATU-C shall transmit *LEN_MEDLEY* symbols. The value *LEN_MEDLEY* shall be the maximum of the CA-MEDLEYus and

'171 Patent, Claim 3	**ADSL2/+**
3. [**Infringement Scenario #1**] In a multicarrier transceiver, a variable state length initialization method comprising:	Products compliant with the ITU-T Recommendation G.992.3 standard comprise a transceiver – a device that both transmits and receives – that establishes a communication link with a transceiver of another product compliant with the ITU-T Recommendation G.992.3 standard using a prescribed method. ITU-T Recommendation G.992.3 (2005) Summary (p. i). "ATU," "ATU-C," and "ATU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.992.3 (2005) § 4 (p. 6) ("ATU-C [is an abbreviation for] ATU at the central office end (i.e., network operator)," and "ATU-R [is an abbreviation for] ATU at the remote terminal end (i.e., CP)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.992.3 (2005) §§ 8.8 (p. 89) and 8.8.1 (p. 89). **8.8 Modulation** The modulator shall modulate a constellation encoder output data frame or sync frame (containing $NSC-1$ complex values Z_i, $i=1$ to $NSC-1$) into a DMT symbol. The data frame can be taken **8.8.1 Subcarriers** A DMT symbol consists of a set of subcarriers, with index $i=0$ to NSC. The DMT subcarriers spacing Δf, shall be 4.3125 kHz, with a tolerance of ± 50 ppm. The subcarrier frequencies shall be An ATU-C establishes a communication link with an ATU-R. ITU-T Recommendation G.992.3 (2005) § 8.13.1.1 (p. 104). **8.13.1.1 Basic functions of initialization** ADSL transceiver initialization is required in order for a physically connected ATU-R and ATU-C pair to establish a communications link. The procedures for initiating a connection are specified in A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2 for both full (§ 8.13) and short (§ 8.14) initialization, which are variable state length initializations because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.992.3 (2005) § 8.13.7 (p. 143).
[a] transmitting to a second multicarrier transceiver information identifying a first value that is used to determine a first minimum number of multicarrier symbols;	The ATU-C transmits the information C-MSG1 that identifies a first value (CA-MEDLEYus). This first value is used to determine a first minimum number of multicarrier symbols, 512 * CA-MEDLEYus. ITU-T Recommendation G.992.3 (2005) § 8.5.3.2 (p. 69) and Table 8-12 (p. 70). The value *CA-MEDLEY* represents the minimum duration (in multiples of 512 symbols) of the MEDLEY state during the Initialization Channel Analysis Phase. It can be different for the ATU-C (*CA-MEDLEYus* indicates the minimum length of the R-MEDLEY state) and the ATU-R (*CA-MEDLEYds* indicates the minimum length of the C-MEDLEY state). See 8.13.5.1.4 and 8.13.5.2.4. The PMD function control parameters exchanged in the C-MSG1 message are listed in Table 8-12.

'171 Patent, Claim 3	ADSL2/+
	Table 8-12/G.992.3 – PMD function control parameters included in C-MSG1 **Octet Nr [i]** / **Parameter** / **PMD format bits [8 × i + 7 to 8 × i + 0]** 0 — *TARSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 1 — *TARSNRMds* (MSB) — [0000 00xx], bit 8 2 — *MINSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 3 — *MINSNRMds* (MSB) — [0000 000x], bit 8 4 — *MAXSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 5 — *MAXSNRMds* (MSB) — [0000 000x], bit 8 6 — *RA-MODEds* — [0000 00xx], bit 1 to 0 7 — *PM-MODE* — [0000 00xx], bit 1 to 0 8 — *RA-USNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 9 — *RA-USNRMds* (MSB) — [0000 000x], bit 8 10 — *RA-UTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 11 — *RA-UTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 12 — *RA-DSNRMds* (LSB) — [xxxx xxxx], bit 7 to 0 13 — *RA-DSNRMds* (MSB) — [0000 000x], bit 8 14 — *RA-DTIMEds* (LSB) — [xxxx xxxx], bit 7 to 0 15 — *RA-DTIMEds* (MSB) — [00xx xxxx], bit 13 to 8 16 — *BIMAXds* — [0000 xxxx], bit 3 to 0 17 — *EXTGIds* — [xxxx xxxx], bit 7 to 0 18 — *CA-MEDLEYus* — [00xx xxxx], bit 5 to 0
[b] receiving from the second multicarrier transceiver information identifying a second value that is used to determine a second minimum number of multicarrier symbols;	The ATU-C receives information R-MSG1 that identifies a second value (CA-MEDLEYds). This second value is used to determine a second minimum number of multicarrier symbols, 512 * CA-MEDLEYds. ITU-T Recommendation G.992.3 (2005) §§ 8.5.3.2 (p. 69) and 8.5.3.2 (p. 70), and Table 8-13 (p. 70). The value *CA-MEDLEY* represents the minimum duration (in multiples of 512 symbols) of the MEDLEY state during the Initialization Channel Analysis Phase. It can be different for the ATU-C (*CA-MEDLEYus* indicates the minimum length of the R-MEDLEY state) and the ATU-R (*CA-MEDLEYds* indicates the minimum length of the C-MEDLEY state). See 8.13.5.1.4 and 8.13.5.2.4. The PMD function control parameters exchanged in the C-MSG1 message are listed in Table 8-12. The PMD function control parameters exchanged in the R-MSG1 message are listed in Table 8-13. **Table 8-13/G.992.3 – PMD function control parameters included in R-MSG1** **Octet Nr [i]** / **Parameter** / **PMD format bits [8 × i + 7 to 8 × i + 0]** 0 — *BIMAXus* — [0000 xxxx], bit 3 to 0 1 — *EXTGIus* — [xxxx xxxx], bit 7 to 0 2 — *CA-MEDLEYds* — [00xx xxxx], bit 5 to 0
[c] selecting a number equal to the greater of the first minimum number of multicarrier symbols and the second minimum	The ATU-C selects the greater of CA-MEDLEYus and CA-MEDLEYds as the value for LEN_MEDLEY. ITU-T Recommendation G.992.3 (2005) § 8.13.5.1.4 (p. 135).

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number of multicarrier symbols; and	symbols. The value *LEN_MEDLEY* shall be the maximum of the CA-MEDLEYus and CA-MEDLEYds values indicated by the ATU-C and the ATU-R in the C-MSG1 and R-MSG1 messages respectively. The value *LEN_MEDLEY* shall be a multiple of 512 and shall be less than or As explained in Sections 8.13.5.1.4 and 8.13.5.2.4, the value of LEN_MEDLEY is the maximum of CA-MEDLEYus, which is part of the C-MSG1 message, and CA-MEDLEYds, which is part of the R-MSG1 message. *See* ITU-T Recommendation G.992.3 (2005) Tables 8-12 (p. 70) and 8-13 (p. 70). **Table 8-12/G.992.3 – PMD function control parameters included in C-MSG1** **Octet Nr [i]** | **Parameter** | **PMD format bits [8 × i + 7 to 8 × i + 0]** 0 | *TARSNRMds* (LSB) | [xxxx xxxx], bit 7 to 0 1 | *TARSNRMds* (MSB) | [0000 00xx], bit 8 2 | *MINSNRMds* (LSB) | [xxxx xxxx], bit 7 to 0 3 | *MINSNRMds* (MSB) | [0000 000x], bit 8 4 | *MAXSNRMds* (LSB) | [xxxx xxxx], bit 7 to 0 5 | *MAXSNRMds* (MSB) | [0000 000x], bit 8 6 | *RA-MODEds* | [0000 00xx], bit 1 to 0 7 | *PM-MODE* | [0000 00xx], bit 1 to 0 8 | *RA-USNRMds* (LSB) | [xxxx xxxx], bit 7 to 0 9 | *RA-USNRMds* (MSB) | [0000 000x], bit 8 10 | *RA-UTIMEds* (LSB) | [xxxx xxxx], bit 7 to 0 11 | *RA-UTIMEds* (MSB) | [00xx xxxx], bit 13 to 8 12 | *RA-DSNRMds* (LSB) | [xxxx xxxx], bit 7 to 0 13 | *RA-DSNRMds* (MSB) | [0000 000x], bit 8 14 | *RA-DTIMEds* (LSB) | [xxxx xxxx], bit 7 to 0 15 | *RA-DTIMEds* (MSB) | [00xx xxxx], bit 13 to 8 16 | *BIMAXds* | [0000 xxxx], bit 3 to 0 17 | *EXTGIds* | [xxxx xxxx], bit 7 to 0 18 | *CA-MEDLEYus* | [00xx xxxx], bit 5 to 0 **Table 8-13/G.992.3 – PMD function control parameters included in R-MSG1** **Octet Nr [i]** | **Parameter** | **PMD format bits [8 × i + 7 to 8 × i + 0]** 0 | *BIMAXus* | [0000 xxxx], bit 3 to 0 1 | *EXTGIus* | [xxxx xxxx], bit 7 to 0 2 | *CA-MEDLEYds* | [00xx xxxx], bit 5 to 0
[d] receiving from the second multicarrier transceiver, during an initialization state, the selected number of multicarrier symbols.	The ATU-C receives the selected number (LEN_MEDLEY) of multicarrier symbols during the R-MEDLEY initialization state. ITU-T Recommendation G.992.3 (2005) § 8.13.5.2.4 (p. 137). **8.13.5.2.4 R-MEDLEY** The R-MEDLEY state is of fixed length. In this state, the ATU-R shall transmit *LEN_MEDLEY* symbols. The value *LEN_MEDLEY* shall be the maximum of the CA-MEDLEYus and

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2. [**Infringement Scenario #2**] In a multicarrier transceiver, a variable state length initialization method comprising:	Products compliant with the ITU-T Recommendation G.992.3 standard comprise a transceiver – a device that both transmits and receives – that establishes a communication link with a transceiver of another product compliant with the ITU-T Recommendation G.992.3 standard using a prescribed method. ITU-T Recommendation G.992.3 (2005) Summary (p. i). "ATU," "ATU-C," and "ATU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.992.3 (2005) § 4 (p. 6) ("ATU-C [is an abbreviation for] ATU at the central office end (i.e., network operator)," and "ATU-R [is an abbreviation for] ATU at the remote terminal end (i.e., CP)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.992.3 (2005) §§ 8.8 (p. 89) and 8.8.1 (p. 89). **8.8 Modulation** The modulator shall modulate a constellation encoder output data frame or sync frame (containing $NSC-1$ complex values Z_i, $i=1$ to $NSC-1$) into a DMT symbol. The data frame can be taken **8.8.1 Subcarriers** A DMT symbol consists of a set of subcarriers, with index $i=0$ to NSC. The DMT subcarriers spacing Δf, shall be 4.3125 kHz, with a tolerance of ± 50 ppm. The subcarrier frequencies shall be An ATU-C establishes a communication link with an ATU-R. ITU-T Recommendation G.992.3 (2005) § 8.13.1.1 (p. 104). **8.13.1.1 Basic functions of initialization** ADSL transceiver initialization is required in order for a physically connected ATU-R and ATU-C pair to establish a communications link. The procedures for initiating a connection are specified in A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2 for both full (§ 8.13) and short (§ 8.14) initialization, which are variable state length initializations because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.992.3 (2005) § 8.13.7 (p. 143).
[a] transmitting to a second multicarrier transceiver information identifying a first value that is used to determine a first minimum number of multicarrier symbols;	The ATU-C transmits the information C-MSG-FMT that identifies a first value (FMT_C-REVERB4). This first value is used to determine a first minimum number of multicarrier symbols, 256 or 1024. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.1.8 (p. 131) and 8.13.3.1.10 (p. 120), and Table 8-26 (p. 120). C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise.

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	8.13.3.1.10 C-MSG-FMT The C-MSG-FMT state is of fixed length. In the C-MSG-FMT state, the ATU-C shall transmit 96 symbols of C-COMB or C-ICOMB to modulate the C-MSG-FMT message and CRC. The C-MSG-FMT message conveys information about the presence, format and length of subsequent ATU-C and ATU-R messages. The C-MSG-FMT message, *m*, is defined by: $m = \{m_{15}, \ldots, m_0\}$ Bits shall be defined as shown in Table 8-26. **Table 8-26/G.992.3 – Bit definition for the C-MSG-FMT message** Bit index | Parameter | Definition 0 | *FMT_R-REVERB1* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 | | Reserved, set to 0. 2 | *FMT_C-REVERB4* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not.
[b] receiving from the second multicarrier transceiver information identifying a second value that is used to determine a second minimum number of multicarrier symbols;	The ATU-C (**Infringement Case #1**) receives the information R-MSG-FMT that identifies a second value (FMT-C-REVERB4). This second value is used to determine a second minimum number of multicarrier symbols, 256 or 1024. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.1.8 (p. 131) and 8.13.3.2.10 (p. 125), and Table 8-31 (p. 126). C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise. **8.13.3.2.10 R-MSG-FMT** The R-MSG-FMT state is of fixed length. In the R-MSG-FMT state, the ATU-R shall transmit 96 symbols of R-COMB or R-ICOMB to modulate the R-MSG-FMT message and CRC. The R-MSG-FMT message conveys information about the presence, format and length of subsequent ATU-C and ATU-R messages. The R-MSG-FMT message, *m*, is defined by: $m = \{m_{15}, \ldots, m_0\}$ Bits shall be defined as shown in Table 8-31. **Table 8-31/G.992.3 – Bit definition for the R-MSG-FMT message** Bit index | Parameter | Definition 0 | *FMT-R-REVERB1* (value 0 or 1) | Set to 1 indicates that the ATU-R requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 | | Reserved, set to 0. 2 | *FMT-C-REVERB4* (value 0 or 1) | Set to 1 indicates that the ATU-R requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not.
[c] selecting the greater of the first minimum number of multicarrier symbols and the second minimum number of	The ATU-C selects the number of multicarrier symbols, LEN_C-REVERB4, based on the values of FMT_C-REVERB4 that are part of the C-MSG-FMT and R-MSG-FMT messages. ITU-T Recommendation G.992.3 (2005) § 8.13.4.1.8 (p. 131).

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multicarrier symbols; and	C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise. As explained in Section 8.13.4.1.8, the value of LEN_C-REVERB4, the number of symbols in C-REVERB4, depends on the values of FMT_C-REVERB4 in the C-MSG-FMT and R-MSG-FMT messages. For example, if one value of FMT_C-REVERB4 is equal to 1 while the other value of FMT_C-REVERB4 is equal to 0, then the ATU-C will select the greater of a first (or second) minimum value of 1024 and a second (or first) minimum value of 256. The ATU-C will select 1024 to be the value of LEN_C-REVERB4 because it is the greater of the two requested minimums. ITU-T Recommendation G.992.3 (2005) Tables 8-26 (p. 120) and 8-31 (p. 126). **Table 8-26/G.992.3 – Bit definition for the C-MSG-FMT message** **Bit index** | **Parameter** | **Definition** 0 | *FMT_R-REVERB1* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 | | Reserved, set to 0. 2 | *FMT_C-REVERB4* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not. **Table 8-31/G.992.3 – Bit definition for the R-MSG-FMT message** **Bit index** | **Parameter** | **Definition** 0 | *FMT-R-REVERB1* (value 0 or 1) | Set to 1 indicates that the ATU-R requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 | | Reserved, set to 0. 2 | *FMT-C-REVERB4* (value 0 or 1) | Set to 1 indicates that the ATU-R requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not.
[d] transmitting to the second multicarrier transceiver, during an initialization state, the selected number of multicarrier symbols.	The ATU-C transmits the selected number (LEN_C-REVERB4) of multicarrier symbols during the C-REVERB4 initialization state. ITU-T Recommendation G.992.3 (2005) § 8.13.4.1.8 (p. 131). **8.13.4.1.8 C-REVERB4** The C-REVERB4 state is of fixed length. In this state, the ATU-C shall transmit *LEN_C-REVERB4* C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the

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3. [**Infringement Scenario #2**] In a multicarrier transceiver, a variable state length initialization method comprising:	Products compliant with the ITU-T Recommendation G.992.3 standard comprise a transceiver – a device that both transmits and receives – that establishes a communication link with a transceiver of another product compliant with the ITU-T Recommendation G.992.3 standard using a prescribed method. ITU-T Recommendation G.992.3 (2005) Summary (p. i). "ATU," "ATU-C," and "ATU-R" are accepted abbreviations for the transceivers. ITU-T Recommendation G.992.3 (2005) § 4 (p. 6) ("ATU-C [is an abbreviation for] ATU at the central office end (i.e., network operator)," and "ATU-R [is an abbreviation for] ATU at the remote terminal end (i.e., CP)."). A transceiver transmits and receives a multicarrier signal. The transceiver produces this signal by modulating signal constellation points on multiple subcarrier frequencies and summing the result into a DMT symbol for simultaneous transmission. ITU-T Recommendation G.992.3 (2005) §§ 8.8 (p. 89) and 8.8.1 (p. 89). **8.8 Modulation** The modulator shall modulate a constellation encoder output data frame or sync frame (containing $NSC-1$ complex values Z_i, $i=1$ to $NSC-1$) into a DMT symbol. The data frame can be taken **8.8.1 Subcarriers** A DMT symbol consists of a set of subcarriers, with index $i=0$ to NSC. The DMT subcarriers spacing Δf, shall be 4.3125 kHz, with a tolerance of ± 50 ppm. The subcarrier frequencies shall be An ATU-C establishes a communication link with an ATU-R. ITU-T Recommendation G.992.3 (2005) § 8.13.1.1 (p. 104). **8.13.1.1 Basic functions of initialization** ADSL transceiver initialization is required in order for a physically connected ATU-R and ATU-C pair to establish a communications link. The procedures for initiating a connection are specified in A transceiver uses the initialization method specified in ITU-T Recommendation G.993.2 for both full (§ 8.13) and short (§ 8.14) initialization, which are variable state length initializations because, for some initialization states, the transceiver can change the length of the initialization state by performing the steps recited in the body of the claim. ITU-T Recommendation G.992.3 (2005) § 8.13.7 (p. 143).
[a] transmitting to a second multicarrier transceiver information identifying a first value that is used to determine a first minimum number of multicarrier symbols;	The ATU-C (**Infringement Case #1**) transmits the information C-MSG-FMT that identifies a first value (FMT_R-REVERB1). This first value is used to determine a first minimum number of multicarrier symbols, 272 or 592. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.2.1 (p. 131) and 8.13.3.1.10 (p. 120), and Table 8-26 (p. 120). *LEN_R-REVERB1* R-REVERB symbols. The value *LEN_R-REVERB1* shall be equal to 592 if the ATU-C or the ATU-R (or both) have set *FMT_R-REVERB1* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_R-REVERB1* shall be equal to 272 otherwise.

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	8.13.3.1.10 C-MSG-FMT The C-MSG-FMT state is of fixed length. In the C-MSG-FMT state, the ATU-C shall transmit 96 symbols of C-COMB or C-ICOMB to modulate the C-MSG-FMT message and CRC. The C-MSG-FMT message conveys information about the presence, format and length of subsequent ATU-C and ATU-R messages. The C-MSG-FMT message, m, is defined by: $m = \{m_{15}, \ldots, m_0\}$ Bits shall be defined as shown in Table 8-26. **Table 8-26/G.992.3 – Bit definition for the C-MSG-FMT message** Bit index | Parameter | Definition 0 | *FMT_R-REVERB1* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 | | Reserved, set to 0. 2 | *FMT_C-REVERB4* (value 0 or 1) | Set to 1 indicates that the ATU-C requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not. The ATU-C (**Infringement Case #2**) transmits the information C-MSG-FMT that identifies a first value (FMT_C-REVERB4). This first value is used to determine a first minimum number of multicarrier symbols, 256 or 1024. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.1.8 (p. 131) and 8.13.3.1.10 (p. 120), and Table 8-26 (p. 120). C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise.
[b] receiving from the second multicarrier transceiver information identifying a second value that is used to determine a second minimum number of multicarrier symbols;	The ATU-C (**Infringement Case #1**) receives the information R-MSG-FMT that identifies a second value (FMT-R-REVERB1). This second value is used to determine a second minimum number of multicarrier symbols, 272 or 592. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.2.1 (p. 131) and 8.13.3.2.10 (p. 125), and Table 8-31 (p. 126). *LEN_R-REVERB1* R-REVERB symbols. The value *LEN_R-REVERB1* shall be equal to 592 if the ATU-C or the ATU-R (or both) have set *FMT_R-REVERB1* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_R-REVERB1* shall be equal to 272 otherwise. **8.13.3.2.10 R-MSG-FMT** The R-MSG-FMT state is of fixed length. In the R-MSG-FMT state, the ATU-R shall transmit 96 symbols of R-COMB or R-ICOMB to modulate the R-MSG-FMT message and CRC. The R-MSG-FMT message conveys information about the presence, format and length of subsequent ATU-C and ATU-R messages. The R-MSG-FMT message, m, is defined by: $m = \{m_{15}, \ldots, m_0\}$ Bits shall be defined as shown in Table 8-31.

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	Table 8-31/G.992.3 – Bit definition for the R-MSG-FMT message (Bit index / Parameter / Definition) 0 — *FMT-R-REVERB1* (value 0 or 1) — Set to 1 indicates that the ATU-R requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 — Reserved, set to 0. 2 — *FMT-C-REVERB4* (value 0 or 1) — Set to 1 indicates that the ATU-R requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not. The ATU-C (**Infringement Case #2**) receives the information R-MSG-FMT that identifies a second value (FMT-C-REVERB4). This second value is used to determine a second minimum number of multicarrier symbols, 256 or 1024. ITU-T Recommendation G.992.3 (2005) §§ 8.13.4.1.8 (p. 131) and 8.13.3.2.10 (p. 125), and Table 8-31 (p. 126). C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise.
[c] selecting the greater of the first minimum number of multicarrier symbols and the second minimum number of multicarrier symbols; and	The ATU-C (**Infringement Case #1**) selects the number of multicarrier symbols, LEN_R-REVERB1, based on the values of FMT_R-REVERB1 that are part of the C-MSG-FMT and R-MSG-FMT messages. ITU-T Recommendation G.992.3 (2005) § 8.13.4.2.1 (p. 128). *LEN_R-REVERB1* R-REVERB symbols. The value *LEN_R-REVERB1* shall be equal to 592 if the ATU-C or the ATU-R (or both) have set *FMT_R-REVERB1* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_R-REVERB1* shall be equal to 272 otherwise. For **Infringement Case #1**, as explained in Section 8.13.4.2.1, the value of LEN_R-REVERB1, the number of symbols in R-REVERB1, depends on the values of FMT_R-REVERB1 in the C-MSG-FMT and R-MSG-FMT messages. For example, if one value of FMT_R-REVERB1 is equal to 1 while the other value of FMT_R-REVERB1 is equal to 0, then the ATU-C will select the greater of a first (or second) minimum value of 592 and a second (or first) minimum value of 272. The ATU-C will select 592 to be the value of LEN_R-REVERB1 because it is the greater of the two requested minimums. ITU-T Recommendation G.992.3 (2005) Tables 8-26 (p. 120) and 8-31 (p. 126). **Table 8-26/G.992.3 – Bit definition for the C-MSG-FMT message** (Bit index / Parameter / Definition) 0 — *FMT_R-REVERB1* (value 0 or 1) — Set to 1 indicates that the ATU-C requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 — Reserved, set to 0. 2 — *FMT_C-REVERB4* (value 0 or 1) — Set to 1 indicates that the ATU-C requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not. **Table 8-31/G.992.3 – Bit definition for the R-MSG-FMT message** (Bit index / Parameter / Definition) 0 — *FMT-R-REVERB1* (value 0 or 1) — Set to 1 indicates that the ATU-R requests an extended duration of the R-REVERB1 state. Set to 0 indicates it does not. 1 — Reserved, set to 0. 2 — *FMT-C-REVERB4* (value 0 or 1) — Set to 1 indicates that the ATU-R requests an extended duration of the C-REVERB4 state. Set to 0 indicates it does not.

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	The ATU-C (**Infringement Case #2**) selects the number of multicarrier symbols, LEN_C-REVERB4, based on the values of FMT_C-REVERB4 that are part of the C-MSG-FMT and R-MSG-FMT messages. ITU-T Recommendation G.992.3 (2005) § 8.13.4.1.8 (p. 131). C-REVERB symbols. The value *LEN_C-REVERB4* shall be equal to 1024 if the ATU-C or the ATU-R (or both) have set *FMT_C-REVERB4* to 1 in the C-MSG-FMT or R-MSG-FMT message respectively. The value *LEN_C-REVERB4* shall be equal to 256 otherwise. For **Infringement Cases #2**, as explained in Section 8.13.4.1.8, the value of LEN_C-REVERB4, the number of symbols in C-REVERB4, depends on the values of FMT_C-REVERB4 in the C-MSG-FMT and R-MSG-FMT messages. For example, if one value of FMT_C-REVERB4 is equal to 1while the other value of FMT_C-REVERB4 is equal to 0, then the ATU-C (**Infringement Case #2**) will select the greater of a first (or second) minimum value of 1024 and a second (or first) minimum value of 256. In **Infringement Cases #2** the ATU will select 1024 to be the value of LEN_C-REVERB4 because it is the greater of the two requested minimums. ITU-T Recommendation G.992.3 (2005) Tables 8-26 (p. 120) and 8-31 (p. 126).
[d] receiving from the second multicarrier transceiver, during an initialization state, the selected number of multicarrier symbols.	The ATU-C (**Infringement Case #1**) receives the selected number (LEN_R-REVERB1) of multicarrier symbols during the R-REVERB1 initialization state. ITU-T Recommendation G.992.3 (2005) § 8.13.4.2.1 (p. 131). **8.13.4.2.1 R-REVERB1** The R-REVERB1 state is of fixed length. In the R-REVERB1 state, the ATU-R shall transmit *LEN_R-REVERB1* R-REVERB symbols. The value *LEN_R-REVERB1* shall be equal to 592 if the The ATU-C (**Infringement Case #2**) receives the selected number (LEN_C-REVERB4) of multicarrier symbols during the R-REVERB4 initialization state. ITU-T Recommendation G.992.3 (2005) § 8.13.4.2.7 (p. 133). **8.13.4.2.7 R-REVERB4** The R-REVERB4 state is of variable length. In this state, the ATU-R shall transmit a minimum of *LEN_C-REVERB4* and a maximum of *LEN_C-REVERB4* + 80 R-REVERB symbols, where LEN_C-REVERB4 is defined in 8.13.4.1.8.

Electronic Proof of Claim_OMWKX28783

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EXHIBIT B

Hearing Date: To Be Determined
Objection Deadline: August 2, 2021 at 4:00 p.m. (Eastern Time)

Martin J. Black (*pro hac vice* application pending)
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UNITED STATES BANKRUPTCY COURT
SOUTHERN DISTRICT OF NEW YORK

In re:	**Chapter 11**
FRONTIER COMMUNICATIONS CORPORATION, *et al.*,[1]	**Case No. 20-22476 (RDD)**
	(Jointly Administered)
Debtors.	

NOTICE OF REQUEST FOR PAYMENT OF ADMINISTRATIVE EXPENSE FOR POST-PETITION INFRINGEMENT OF PATENTS HELD BY INTELLECTUAL VENTURES II LLC

PLEASE TAKE NOTICE that a hearing (the "Hearing") on the attached Request for Payment of Administrative Expense for Post-Petition Infringement of Patents Held by Intellectual Ventures II LLC (the "Request for Payment") will be held before the Honorable Robert D. Drain, United States Bankruptcy Judge, at the United States Bankruptcy Court for the Southern District

[1] The last four digits of Debtor Frontier Communications Corporation's tax identification number are 9596. Due to the large number of debtor entities in these chapter 11 cases, for which joint administration has been granted, a complete list of the debtor entities and the last four digits of their federal tax identification numbers are not provided herein. A complete list of such information may be obtained on the website of the Debtors' proposed claims and noticing agent at https://cases.primeclerk.com/ftr. The location of the Debtors' service address for purposes of these chapter 11 cases is: 50 Main Street, Suite 1000, White Plains, New York 10606.

of New York, 300 Quarropas Street, White Plains, NY 10601-4140 (the "Bankruptcy Court") at a date and time to be determined. In accordance with General Order M-543 dated March 20, 2020, the Hearing will be conducted telephonically. Any parties wishing to participate must make arrangements through Court Solutions by visiting https://www.court-solutions.com.

PLEASE TAKE FURTHER NOTICE that objections, if any, to the relief sought in the Request for Payment shall be in writing, state with particularity the basis for the objection and be filed with the Bankruptcy Court in accordance with the Local Rules by users of the Bankruptcy Court's case filing system, and by all other parties by electronic service, with a hard copy to Chambers, and served in accordance with the Local Rules and the Case Management Procedures (ECF 390) and upon counsel to (i) Intellectual Ventures II LLC, Dechert LLP, Three Bryant Park, 1095 Avenue of the Americas, New York, NY 10036-6797, Attn: Martin J. Black, Esq., Jeffrey B. Plies, Esq., and David A. Herman, Esq.; (ii) the Debtors, Kirkland & Ellis LLP, 601 Lexington Avenue, New York, New York, 10153, Attn: Stephen E. Hessler, Esq., Mark McKane, Esq., and Patrick Venter, Esq.; (iii) counsel to the unsecured creditors' committee, Kramer Levin Naftalis & Frankel LLP, 1177 Avenue of the Americas, New York, New York 10036, Attn: Douglas H. Mannal, Esq., Jennifer Sharret, Esq., and Megan Wasson, Esq.; and (iv) the Office of the United States Trustee for the Southern District of New York, 201 Varick Street, Room 1006, New York, New York 10014, so as to be received no later than August 2, 2021 at 4:00 p.m. (the "Objection Deadline").

PLEASE TAKE FURTHER NOTICE that if an objection to the Request for Payment is not received by the Objection Deadline, the relief requested shall be deemed unopposed, and the Bankruptcy Court may enter an order granting the relief sought without a hearing.

Hearing Date: To Be Determined
Objection Deadline: August 2, 2021 at 4:00 p.m. (Eastern Time)

Martin J. Black (*pro hac vice* application pending)
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Counsel to Intellectual Ventures II LLC

UNITED STATES BANKRUPTCY COURT
SOUTHERN DISTRICT OF NEW YORK

In re:	**Chapter 11**
FRONTIER COMMUNICATIONS CORPORATION, *et al.*,[2]	**Case No. 20-22476 (RDD)**
Debtors.	**(Jointly Administered)**

REQUEST FOR PAYMENT OF ADMINISTRATIVE EXPENSE FOR POST-PETITION INFRINGEMENT OF PATENTS HELD BY INTELLECTUAL VENTURES II LLC

Intellectual Ventures II LLC ("IV") hereby files this Request for Payment from Frontier Communications Corporation and its debtor affiliates (collectively, "Frontier" or the "Debtors"), in the amount of $1,699,102, plus trebling and attorneys' fees, for the Debtors' infringement of

[2] The last four digits of Debtor Frontier Communications Corporation's tax identification number are 9596. Due to the large number of debtor entities in these chapter 11 cases, for which joint administration has been granted, a complete list of the debtor entities and the last four digits of their federal tax identification numbers are not provided herein. A complete list of such information may be obtained on the website of the Debtors' proposed claims and noticing agent at https://cases.primeclerk.com/ftr. The location of the Debtors' service address for purposes of these chapter 11 cases is: 50 Main Street, Suite 1000, White Plains, New York 10606.

patent assets held by IV between the commencement of these chapter 11 cases (the "Petition Date") and the Effective Date of the Debtors' Plan.[3]

IV'S ASSERTED PATENTS

1. IV owns all substantial right, title, and interest in the following U.S. patents (the "Asserted Patents"):

2. On November 11, 2003, United States Patent No. 6,647,068 (the "'068 Patent"), titled "Variable State Length Initialization," was duly and lawfully issued by the United States Patent and Trademark Office (the "PTO").

3. On September 28, 2004, United States Patent No. 6,798,735 (the "'735 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

4. On September 18, 2007, United States Patent No. 7,272,171 (the "'171 Patent"), titled "Variable State Length Initialization," was duly and lawfully issued by the PTO.

5. On October 19, 2010, United States Patent No. 7,817,532 (the "'532 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

6. On February 5, 2013, United States Patent No. 8,369,275 (the "'275 Patent"), titled "Adaptive Allocation for Variable Bandwidth Multicarrier Communication," was duly and lawfully issued by the PTO.

FRONTIER'S INFRINGEMENT

7. The Debtors have infringed and are continuing to infringe the Asserted Patents as follows:

[3] Capitalized terms not otherwise defined herein shall have the meanings given to them in the *Notice of (I) Entry of Confirmation Order, (II) Occurrence of Effective Date, and (III) Related Bar Dates* (ECF 1793).

8. During the period subsequent to the Petition Date, Frontier has been infringing at least claims 7, 8, 16, and 17 of the '068 Patent and claims 2 and 3 of the '171 Patent under 35 U.S.C. Section 271, by Frontier's use of at least the Adtran 1248, Adtran 1148, Adtran TA5000, Adtran TA3000, Alcatel 7300, Calix E5, Calix E7, Calix C7 digital subscriber line access multiplexers (DSLAMs), implementing VDSL2 and/or ADSL2/2+ technical communications standards promulgated by the International Telecommunication Union (ITU-T).

9. Exemplary claim charts outlining how Frontier has been infringing the '068 and '171 Patents through Frontier's use of products implementing particular ITU-T technical standards were previously submitted as supporting documentation to IV's proofs of claim with respect to Frontier's prepetition infringement and are hereby incorporated by reference as if fully recited herein. *See, e.g.*, Claim No. 2526.[4]

IV'S CLAIM FOR ROYALTY DAMAGES BASED ON FRONTIER'S INFRINGEMENT

10. IV is party to a Patent License Agreement executed by one of Frontier's similarly-situated competitors, in which Frontier's competitor agreed to license, *inter alia*, the Asserted Patents (the "Competitor License").[5]

11. IV and Frontier's competitor executed the Competitor License following IV's assertion of the '068 and '171 patents in prior litigation against Frontier's competitor.

12. The terms of the Competitor License are comparable to those that Frontier owes to IV as compensation for its infringement of IV's patents.

[4] IV submitted the following proofs of claim: 2365, 2366, 2367, 2371, 2401, 2407, 2415, 2433, 2453, 2461, 2469, 2472, 2513, 2514, 2519, 2521, 2526, 2529, 2532, 2535, 2536, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2547, 2548, 2549, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2562, 2563, 2564, 2566, 2567, 2568, 2570, 2571, 2572, 2574, 2575, 2577, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2597, 2598, 2599, 2600, 260, 2602, 2603, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2615, 2616, 2617, 2618, 2619, 2621, 2622, 2624, 2625, 2626, 2627, 2628, 2630, 2631, 2632, 2633, 2634, 2671.

[5] The Competitor License has been produced to counsel for the Debtors pursuant to the Court's protective order.

13. Based on the royalty terms of the Competitor License, the date of Frontier's commencement of these chapter 11 cases, and the date the Plan became effective, Frontier owes IV a royalty of $0.488 per subscriber as compensation for Frontier's post-petition infringement of the '068 and '171 patents through the Effective Date.

14. Frontier's May 6, 2020 SEC 10-Q filing reports that as of March 31, 2020, Frontier had 3.48 million DSL subscribers.

15. For the period beginning April 14, 2020 (the Petition Date) through April 30, 2021 (the Effective Date), Frontier accordingly owes to IV royalty damages of $1,699,102.

16. The Debtors' infringement subsequent to the filing of IV's prepetition proofs of claim has been willful. IV's proofs of claim provided the Debtors with knowledge of the '068 and '171 patents, allegations of infringement, and detailed claim charts explaining how the Debtors have been infringing the patent claims. Nevertheless, the Debtors have failed to abate or mitigate their infringement. Pursuant to 35 U.S.C. § 284, IV requests that the amount of royalty damages be increased by three times. Additionally, the Debtors' continued infringement in the wake of IV's proofs of claim makes this an exceptional case, and IV should be awarded its attorneys' fees pursuant to 35 U.S.C. § 285 or as otherwise permitted by law.

17. IV also requests that the Court award it ongoing running royalties for any infringement by Frontier subsequent to the Effective Date of the Plan up until expiration of the '068 and '171 patents.

18. Under established law, such damages for post-petition patent infringement are treated as administrative expenses under the Bankruptcy Code.[6] *See, e.g., Reading Co. v. Brown,*

[6] The Debtors' liability for post-petition patent infringement arises in the ordinary course of the Debtors' businesses and, accordingly, under paragraph 103 of the Confirmation Order and Article II, Section A of the Plan, IV is not required to file this Request for Payment by the administrative claims bar date. *See Sanchez v. Nw. Airlines, Inc.*, 659 F.3d 671, 677 (8th Cir. 2011). IV files this Request for Payment, however, in an abundance of caution.

391 U.S. 471, 482-83 (1968); *In re Eagle-Picher Indus., Inc.*, 447 F.3d 461, 464 (6th Cir. 2006) (collecting authority); *Carter-Wallace, Inc. v. Otte*, 474 F.2d 529, 533 (2d Cir. 1972).

RESERVATION OF RIGHTS

19. IV reserves all rights to pursue, and intends to pursue, all available remedies for Frontier's continuing infringement of the '068 and '171 Patents.

20. This Request for Payment is without prejudice to any other claim or cause of action that IV or its affiliates may have against Frontier and/or any affiliated, parent, and/or subsidiary entities.

CONCLUSION

21. For the reasons set forth above, IV respectfully requests allowance and payment of $1,699,102, plus trebling and attorneys' fees, as an administrative expense for the Debtors' post-petition patent infringement through the Effective Date of the Plan.

DATED: June 1, 2021

Respectfully submitted,

/s/ David A. Herman

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Counsel to Intellectual Ventures II LLC

CERTIFICATE OF SERVICE

I hereby certify that on June 1, 2021, I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system, which will send a notification of such filing to all ECF recipients in the above-captioned matter.

DATED: June 1, 2021

Respectfully submitted,

/s/ David A. Herman

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